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TRAFFIC PARKING AND TRANSPORTATION ANALYSIS

CENTRAL BUSINESS DISTRICT AREA

BOSTON, MASSACHUSETTS

BARTON-ASCHMAN ASSOCIATES

SEPTEMBER 1965

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INTRODUCTION

This report presents a summary of the traffic, parking, and circulation studies undertaken by Barton-Aschman Associates with respect to the Central Business District Area of Boston, during the period 1963 to present. The report is divided into four sections as follows:

1. A review of background studies of the Central Business District including a chronological listing of special studies and reports prepared previously by Barton-Aschman Associates.

2. A statement of the deficiencies currently existing in the Central Busines District in terms of street widths, traffic handling capacity, parking, truck servicing and other factors relative to the effeciency and effectiveness of the street system as a whole.

3. A summary of findings of existing and anticipated conditions involving traffic operations, present circulation, estimates of future travel and parking needs and finally the establishment of criteria for circulation planning in downtown Boston. (It should be noted that this section of the report is a summary of four previous reports submitted by Barton-Aschman Associates to the Boston Redevelopment Authority and which are appended to this report for reference.)

4. A description of street and parking improvements made possible through the proposed early land acquisition program now under consideration by by the Boston Redevelopment Authority, and including the relationships of these improvements to a conceptual framework for the overall improveme of Central Business District traffic, parking, and circulation.

Included as an Appendix to this report is a brochure setting forth the qualificat of Barton-Aschman Associates. Previously, in the Boston area, the firm has engag in studies of the Government Center Area, the North Terminal Area, the South Cove Area, and various special studies for the Massachusetts Port Authority, Massachus Institute of Technology, and other public and private agencies in the area.

1. BACKGROUND STUDIES

As a part of the circulation planning process for the Central Business District Area all available information on traffic, parking and transportation has been analyzed. This has included Cordon Count reports prepared by the Boston Traffic Commission, data and reports prepared by Wilbur Smith and Associates dealing with transportation in the Boston area, special transportation reports prepared by Boston College, data from the Massachusetts Bay Transportation Authority, Massachusetts Department of Public Works, and the Metropolitan District Commission, plus background information from the files of the Boston Redevelopment Authority.

In addition to this analysis of available information, special data has been collected by Barton-Aschman Associates during 1963-64 as follows:

(a) Various traffic volume counts and intersection turning movement studies

(b) Origin-destination studies of motorists at selected locations in the downtown area

(c) Pedestrian counts and interviews to disclose walking distances and patterns

(d) Special interviews of employees and patrons at selected locations to disclose mode of transportation used and purpose of trip

(e) Inventory of all on and off-street parking spaces in the Central Area

(f) Parking occupancy and turnover studies throughout the area

(g) Inventory of truck loading activities in the Central Area, both on-street and off-street.

The analysis of information available from various sources plus the special studies mentioned in the preceding has been embodied in four reports previously submitted by Barton-Aschman Assocates as follows:

Principles Governing Downtown Boston Circulation Planning, August 19, 1963

Inventory of Plans and Projects of Public Transportation Agencies as They Affect Downtown Boston, September 12, 1963

Establishment of Preliminary Circulation Planning Criteria for Downtown Boston, September 20, 1963

Analysis of Existing Circulation and Parking in Downtown Boston, June 23, 1964

2. SUMMARY OF DATA AND PRINCIPLES

It is estimated that the number of people who travel to Downtown Boston during an average day is about 570,000. This figure does not include walking trips, trips through the downtown area, or those trips generally contained entirely within the area. The amount of future travel Downtown can be expected to increase in the same general proportions as the amount of additional development to occur within the area. Studies by others have indicated a potential growth of from 15 to 20 per cent in the entire Downtown area by 1980. Such growth will cause an additional 70,000 to 100,000 persons to be attracted into the Downtown area each day with total average flow approximating 670,000 person trips per day.

Of the existing 570,000 person trips a day to the entire Downtown area it is estimated that about 300,000 of these trips are destined to the Central Business District. By 1980 this figure should increase to between 335,000 and 385,000 person trips per day.

The existing and future anticipated modal split of trips destined for the Central Business District is as indicated in the following table:

	Existing	Future
Total person trips per day	300,000 - 320,000	335,000 - 385,000
Transit trips per day	135,000 - 145,000	160,000 - 180,000
Vehicle * trips per day	110,000 - 120,000	120,000 - 140,000

* Vehicle trips are calculated at an average of 1.54 person per vehicle.

Studies also indicate that there is a significant amount of through traffic in the core area amounting to 30 to 40 per cent of the total traffic flow. Further, an additional 20 to 25 per cent of traffic on any given street is likely to be travelling in an indirect or a direction contrary to that in which it would like to proceed.

Regarding parking, there is presently capacity for approximately 13,000 vehicles to be parked at a given time, however studies show an existing demand for nearly 15,000 parking spaces. When projected to reflect future growth, a parking demand of about 22,000 vehicles is expected to occur.

Although principles governing downtown Boston circulation planning are set forth in the attached report dated August 19, 1963, certain of these key principles are restated in this special report for purposes of emphasis. These include the following:

- The street system should be designed to provide sufficient capacity for existing and anticipated vehicle loads in the Central Business District

- The vehicular circulation pattern should be understandable and comprehensible to the average driver with a directness and completeness to the pattern so as not to compel added unnecessary travel.

- Complex intersections (those with more than four legs) and offset intersections should be eliminated wherever possible

- While parking should not be encouraged on major elements of the downtown street system, it should be recognized that curb lanes will inevitably be used for stopping both of passenger and service vehicles; street widths should be wide enough to allow this inevitable condition to occur

- Although a balanced circulation system is essential to the well being of the Central Business District, it must be recognized that there are legitimate parking needs which will increase as regional highway construction and street improvements are completed. Sufficient parking must be provided to allow the Central Area to function efficiently.

- Parking facilities should serve clearly identifiable classes of users with major parking concentrations desirably located around the periphery of the Central Area.

- The location of parking facilities should be closely co-ordinated with major street and highway approach routes for the Central Business District.

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3. EXISTING DEFICIENCIES

The street system of central Boston is an ancient system, and it was built piecemeal in the earliest years of the City. It reflects a pattern of growth never calculated to accommodate the traffic and transportation needs of the present day. In respect to the key principles of adequate capacity understandable circulation pattern, parking sufficiency and good public transportation, it is seriously deficient throughout the entire Central Business District Project area. The few streets here and there throughout the area, such as Tremont, Congress, Boylston, Stuart and Kneeland, which might otherwise be accepted as approaching modern standards are overloaded due to the deficiencies of the remaining street system.

The required capacity of any street is primarily dependent on the traffic loads to be placed upon it. Under even the lightest loading conditions, however, and under the most favorable operations, there are bare minimums that might be considered acceptable. In a dense commercial area such as central Boston, where it is acceptable to operate streets one-way if necessary and where parking conceivably can be restricted except for occasional stopping along one side, a minimum dimension is considered to be 33 feet curb to curb. This provides opportunity to allow for one lane blocked by an occasional stopped vehicle and two lanes for traffic to proceed smoothly without undue interference. The following list of streets in central Boston are a part of the basic circulation system, yet are woefully lacking in capacity as shown by their curb to curb dimensions.

Circulation Streets Below Minimum Acceptable Width

STREET	AT	WIDTH (FEET)
Arch	Franklin	26
Bedford	Chauncy	21
Bromfield	Tremont	22
Court	Washington	25
Devonshire	Water	29
Essex	Atlantic	29
Franklin	Hawley	32
Harrison	Kneeland	32
Kingston	Bedford	26
Milk	Washington	32
Otis	Summer	31
School	Washington	21
State	Washington	22
Washington	Milk	28
Water	Washington	21
West	Tremont	22
Winter	Tremont	20

There are still other streets in the central area which are not part of the asic circulation system but are connectors from one street to another and are ervice streets for the adjoining properties. These streets generally have light

traffic volumes but they must be expected to accommodate occasional stopped vehicles on either side or to be operated two-way with stopping on one side. In either event, the minimum dimension of 33 feet should also apply to these. A list of these streets in the central area which fail to meet this requirement is shown below.

Service Streets Below Minimum Acceptable Width

STREET	AT	WIDTH (FEET)
Avery	Tremont	26
Carver	Boylston	20
Columbia	Essex	20
East	Atlantic	27
Edinboro	Essex	18
Hawley	Franklin	27
Hudson	Kneeland	24
LaGrange	Tremont	18
Temple Place	Tremont	28
Tyler	Kneeland	24

In addition to the circulation and connecting streets there are numerous minor streets which form very short connections or dead-end access. Some of these are of extremely narrow width, hardly able to accommodate even one vehicle entering and often necessitating backing out into the intersecting street for departure. These also contribute to a serious capacity deficiency by their interference with normal flow on the intersecting streets.

Continuity of width is another vital factor affecting capacity. All of the widths quoted previously were typical widths of the described streets at specific points. The fact is that many of these widths vary block to block and even within the blocks. None of those named however, with the exception of Franklin Street near Arch Street, ever achieve the minimum acceptable width of 33 feet. This variation in width causes variation in capacity and results in difficulties in establishing uniformity of flow throughout the street length. An example of a street that suffers this variation is shown below in the several widths of Devonshire Street at various points along its length.

Typical Street Width Variations

STREET	AT	WIDTH (FEET)
Devonshire	Summer	29
Devonshire	Franklin	32
Devonshire	Milk (S)	25
Devonshire	Milk (N)	29
Devonshire	State	32

In the consideration of street widths and variability of widths, it must be borne in mind that lane widths for operating streets exhibit very rigid limits on acceptable variation. Only one or two feet difference when dimensions are

minimum can have the effect of virtually eliminating the entire capacity of a travel lane.

For a street system to be understandable and comprehensible to the average driver there is a requirement for sufficient continuity of a sufficient number of streets to afford this clarity. If a street has continuity and has sufficient width to be operated two-way it provides clarity in an of itself. If it is so narrow that it must be operated one-way, its companion for return movement must be close enough and sufficiently similar in alignment to afford the needed clarification of movement. The street system of central Boston generally lacks both.

In the north-south direction the only continuous streets are Tremont, Washington and Congress, and Congress is the only one of sufficient width for two-way operation. Tremont and Washington form a reasonable pair in the sense of clarity but vary so widely in capacity that they do not match, and there are no other matching streets to pair with them. In the east-west direction the only truly continuous streets are State Street, Summer-Winter and Stuart-Kneeland. Of these only Stuart-Kneeland is wide enough for two-way operation, and State is so distant from Summer-Winter that it does not constitute the returning flow.

There are three other streets Franklin-Bromfield, Bedford-West and Boylston-Essex that almost form continuous streets but each suffers offsets in alignment in at least one location. Offsets in alignment destroy both clarity and capacity. An offset requires some travel on the intersecting street, whether it be only a few feet or as much as 50 feet. This doubles the demand on the intersecting street, requires turning maneuvers through the intersection and otherwise confuses and congests traffic. There are a substantial number of such offsets in the central area street system as shown in the list below.

Offset Intersections

STREET	STREET	AT
Beach	LaGrange	Washington
Hayward Place	Avery	Washington
Boylston	Essex	Washington
Franklin	Bromfield	Washington
Kingston	Otis	Summer
Chauncy	Arch	Summer
Water	Water	Congress
Tyler	Oxford	Beach
Tufts	East	South

Another measure of the lack of continuity in a street system is the number of "T" intersections which occur. A "T" intersection is formed when one street, usually minor, enters another more important street but does not cross it. In many cases, unfortunately, the minor street is not really minor, such as School at Washington or Park at Tremont, but nevertheless it is there and represents a true discontinuity in the pattern. These "T" intersections are not necessarily bad in themselves. They are often useful if the minor street performs a service and does not carry major volumes. However, when they occur in great numbers as shown in the listing below it is indicative of severe discontinuities in the street system. Those that involve two streets which are part of the basic circulation system are among the worst problems of Boston's central area.

"T" Intersections

THROUGH STREET	"T" STREET	THROUGH STREET	"T" STREET
Tremont	Park	Summer	Devonshire
Tremont	Bromfield	Summer	Hawley
Tremont	Winter	Milk	Hawley
Tremont	Temple Pl.	Milk	Arch
Tremont	West	Milk	Federal
Tremont	LaGrange	Bromfield	Province
ashington	State (S)	School	Province
ashington	Water	Boylston	Carver
ashington	School	Boylston	Hadassah Way
ashington	Milk	Providence	Hadassah Way
tlantic	Kneeland	Chauncy	Avon
tlantic	Beach	Bedford	Columbia
tlantic	East	Bedford	Harrison
tlantic	Essex	Essex	Oxford
		Essex	Edinboro

Still one more factor affecting both capacity and clarity is the multi-leg intersection. This is any intersection which has extensive unchannelized open space or has more crossings than one street crossing another. This type intersection requires multiple phasing of signal controls, special treatment for protection of pedestrians and vehicles and generally interferes with the smooth flow of traffic. The central area of Boston contains a substantial number of such intersections as shown in the tabulation below.

Multi-Leg Intersections

Park Square
Essex - Surface Artery
Harrison-Chauncy-Essex
Church Green
Dewey Square
Post Office Square
State-Devonshire-Congress

All of the above deficiencies contribute to the problems of traffic movement in central Boston. There are others which have been left unnamed involving various minor streets or alley ways which contribute to the problem but are not the main source of difficulty.

In considering possible traffic improvements for central Boston, ways and means of eliminating or lessening the deficiencies must be considered. The possibility of widening those streets in the basic circulation pattern which are below standard must be considered. In some cases closing them and replacing them with other streets can be the proper solution. Service streets below standard width can either be widened or, in some cases, entirely eliminated. All offset intersections that must be retained should be joined in proper fashion. "T" intersections should be reduced in number by elimination of some streets, and cutting through others to join streets needed for the basic circulation pattern.

Throughout the same parts of the central area in which the street capacity and contuinity deficiencies are at their worst, there is a serious deficiency of commercial service facilities. The absence of these facilities seriously aggravates the problem by requiring loading and unloading of commercial venicles on the very streets which are deficient in width for even occasional stopping. Improvements to circulation must consider means of handling as much commercial loading off-street as can be devised.

Another contributing factor to circulation deficiency is the inadequacy of sidewalks in certain portions of the central area to handle the major pedestrian volumes found at critical points. The most outstanding and noticable location in this respect is the intersection of Summer-Winter Street with Washington Street. All along Washington Street from Boylston-Essex to School Street there is frequently a lack of sidewalk space to contain the total number of pedestrians demanding movement. The inevitable outcome is an overflow into the travel roadway. Similar conditions prevail along School Street, Bromfield Street, Winter Street, and Temple Place. Crossing pedestrians at Tremont and Beacon, Tremont and Park and Tremont and Boylston often find the sidewalk capacity inadequate. For even moderate levels of pedestrian traffic found in an active retail commercial center 10 foot sidewalks are an absolute minimum and in many instances up to 20 feet may be needed. Typical deficient sidewalk widths in central Boston are shown in the tabulation below.

Sidewalks Below Minimum Acceptable Width

STREET	SIDE	AT	SIDEWALK WIDTH (FEET)
Arch	Both	Summer	8
Bedford	Both	Washington	7
Boylston	Both	Washington	8
Bromfield	Both	Washington	6
Devonshire	Both	Milk	8
Franklin	S	Washington	6
LaGrange	Both	Tremont	6
Milk	S	Washington	8
State	Both	Washington	8
Washington	E	State	8
Washington	W	Summer	9
Washington	W	Temple Place	8
Washington	E	Essex	9
West	Both	Washington	7
Winter	S	Tremont	8

A general, but very significant, measure of the deficiencies existing in the overall street system is a comparison of existing and anticipated future volumes versus available capacity. The following table lists these volumes, and expresses capacities in terms of existing and required number of moving traffic lanes. This data is presented for several screenlines or lines which intercept all streets in a particular direction, as noted.

Screenline Analysis and Lane Requirements

Screenline Location	Street Included	Existing Daily Traffic	Future Daily Traffic	Existing No. of Lanes	Required No. of Lanes
So. of State-Court	N-S Streets from Tremont to Atlantic	58,000	90,000	16	22
So. of Summer-Winter	N-S streets from Tremont to Atlantic	70,000	100,000	17	25
No. of Stuart-Kneeland	N-S streets from Broadway to Atlantic	64,000	75,000	18	19
E. of Washington	E-W streets from State to Kneeland	51,000	60,000	13	15

Adequate off-street parking, to accommodate those who use private vehicles for travel to the central area, is essential if traffic circulation is to be improved and economic activity to be maintained. Even though the central area is and should be served by an extensive public transportation system, it must be expected that a large number of visitors will come by private vehicle. If they cannot be accommodated off-street they will demand curb space thus totally consuming the small amount that can logically be made available for occasional stopping. On other streets they seriously hinder the use of the needed lanes for traffic movement. The parking studies which have been conducted indicate there is an immediate deficiency of at least 1,600 spaces simply to eliminate poor parking practices in the heart of the Central Business District. Projections of expected growth and considerations of plan developments in fringe areas where substantial amounts of parking is now accommodated suggests a potential defficiency of nearly 10,000 vehicle spaces. The shortage is especially apparent in respect to short term and errand type parking.

The location of parking spaces in the central area is also deficient. Many of the facilities that do exist are not properly related to the area of demand nor are they related to adequate street capacity and adequate access from the surrounding highway system. The circulation plan must take all these factors into consideration in the development of the proper parking program.

The existing public transportation system exhibits serious deficiencies. Central Boston is serviced by four subway tubes traversing the central area in a fairly adequate pattern. It is an old system, however, and suffers from many years of neglect. Many of the stations are difficult to locate and there is not easy access from one route to another. There is a need to upgrade the entire system, to relocate some of the stations entries and platforms and to generally improve the interchange of persons between routes and their distribution to the various areas of the center. There is no surface transit system to serve short haul riders in the central area. This is undoubtedly due, at least in part, to the narrow discontinuous street system which will not accommodate typical standard bus transit service. Consideration must be given to special means of shuttling or short hauling passengers through the central area. All these improvements are essential if the public transportation system is to keep pace with planned highway improvements which will increase accessibility by private vehicle to the central area.

We conclude that the street, parking and transit system of the Central Business District is seriously deficient when measured against reasonable modern standards. As such the present street system inevitably retards the growth and economic health of the area. It constitutes a major element contributing to substandard conditions and environmental blight throughout the entire Central Business District. One of the basic ingredients of a healthy central area is its accessibility. To such extent as this accessibility is improved, the general well being of the area can be expected to improve. To such extent that it is left substandard and deficient, it must be expected to continue as a blighting influence.

4. PROPOSED STREET AND PARKING IMPROVEMENTS

A conceptual plan is in the process of being developed for downtown Boston streets. In general, this plan includes the provision of more continuity in a north-south direction especially in the area between Washington and Congress Streets and the elimination of offsets in an east-west direction in order to provide several one-way couples.

For example, it is proposed that School Street be connected to Milk Street, with this route operating as a companion to a proposed interconnected Franklin-Bromfield alignment. South of the retail core a similar one-way couple is proposed to be made out of an improved Bedford Street and Boylston connected to Essex.

The conceptual plan also envisions the extension of Charles Street to replace Broadway and to properly interconnect with the street system developed in the South Cove Area. As part of the circulation and parking concept it is proposed that extensive off-street parking facilities be provided at the junction of the Massachusetts Turnpike Extension and the Central Artery, or more specifically in the South Station area. Such a parking facility which might provide four to five thousand spaces would be capable of doing much to relieve the surface street system of unnecessary traffic loads in the core area.

Each of the improvements numerated in the preceding is possible of attainment through the early land acquisition program proposed by the Boston Redevelopment Authority. These improvements will constitute a significant upgrading of the circulation, parking, and transportation facilities required to serve the area.

APPENDIX

ARTON-ASCHMAN ASSOCIATES, INC.

ineering and Planning Consultants *Chicago and Evanston*

MEMORANDUM TO: William McGrath
Boston Redevelopment Authority

FROM: Michael A. Powills, Jr
Barton-Aschman Associates, Inc.

DATE: August 19, 1963

SUBJECT: Principles Governing Downtown Boston Circulation Planning

Enclosed are ten copies of our draft relating to the above subject. May we have your reactions.

PRINCIPLES GOVERNING CIRCULATION PLANNING FOR DOWNTOWN BOSTON

A. INTRODUCTION

The following represent a set of principles intended to help guide the development of a general plan for downtown Boston. The principles deal with all phases of downtown circulation including public transportation, vehicular circulation, parking, pedestrian circulation, service and emergency vehicle facilities, and several general conditions. The following are intended only as guides. Although the principles may range from the obvious to the extremely difficult, nevertheless, it is desirable to set them forth.

B. TRANSIT

1. Maximum use should be made of public transit facilities to and from the downtown area. This involves taking a positive approach to transit improvements, not only downtown, but including such aspects as route extension and other outlying improvements.

2. From the standpoint of downtown development, the most important transit patron is the employee. Maximum accommodation of employee loads by transit will most effectively reduce peak hour vehicular requirements.

3. Rapid transit should be emphasized as the most effective and efficient form of public transportation.

4. Nevertheless, surface transit (buses) should not be neglected as a means of adding to the total public transportation capabilities available to serve the Central Area.

5. Priority in the use of street facilities should be given the transit vehicles, especially surface transit. This may mean special transit lanes or transit malls.

6. To the extent possible, commuter transit facilities should serve as their own Central Business District distributors, thereby eliminating transfers to other transit vehicles or changes of mode of transportation.

7. Maximum use should be made of transit (possibly a special type or at least in addition to commuter transit facilities) for linkages nearby and through the Central Area. This is to minimize short length cross-haul trips which would otherwise be inconvenient or which might occur by means of private passenger vehicles.

8. To the extent possible, the principle of through-routing should be applied to all transit facilities entering the Central Area to avoid the looping and artifical doubling of transit vehicle loads. This involves establishing continuity of routes through the area both on rapid transit facilities and surface bus lines.

9. Land uses should be so located to capitalize on transit facilities as well as to maximize the market for transit; similarly, transit should be so located to serve land use most advantageously.

C. VEHICULAR CIRCULATION

1. The purpose of streets in the Central Area should be:

   a. To provide access to the area and access to land uses in the area.

   b. To serve short-haul traffic (which is not by-passable) moving across the area.

   c. Long-distance, conventional through traffic should be avoided on downtown streets. First, adequate bypass facilities should be provided to attract through traffic away from the downtown area and, second, measures should be taken to discourage that through traffic which does enter the downtown area.

2. The circulation system of the downtown area should connect with both existing and proposed major thoroughfares beyond the area.

3. There should be a continuity of capacity commensurate with 1. a. and 1. b. above.

4. The downtown street system should be designed to handle peak hour traffic loads for a period of 20 years hence. Street designs should be based on practical capacity (or from 350 to 400 vehicles per lane per hour in the core area and 600 or more vehicles per lane per hour on relatively more free-flowing approach routes).

5. The vehicular circulation pattern should be understandable and comprehensible to the average driver.

6. The system should be flexible, i.e., should present more than one opportunity to reach a given destination.

7. There should be a directness to the circulation pattern so as not to compel added round-about travel.

8. The ability to circulate around those blocks or areas which are high traffic generators should be provided.

9. Care should be taken in intermixing one-way and two-way streets to maintain a reasonably consistent pattern of operation.

10. The circulation system should be designed so as not to exaggerate the quantity or pattern of turning movements.

11. Ideally, given streets should perform specific functions (as for example, approach routes, local access streets, cross-area streets, etc.) to the extent that a hierarchy can be identified. This should be done through the use of street design techniques, traffic control measures, parking regulations, etc.

12. Different types of traffic should be separated by a combination of either horizontal or vertical dispersal. Ideally, for example, pedestrians and public carriers, private passenger vehicles, and service vehicles should all be physically separated.

13. For the sake of safe and convenient pedestrian crossings, streets should have no more than four moving lanes, unless medians with suitable pedestrian refuges are provided.

14. In the design of the downtown street system it should be assumed that no parking will be permitted on major elements. Nevertheless, it must be recognized that unless land uses are significantly reorganized, it is inevitable that the curb lanes will be used for stopped vehicles and can not, therefore, carry significant amounts of moving traffic.

15. Complex intersections (more than 4-legged) and multi-phase signals should be avoided.

16. The arrangement of streets and land development should be designed to avoid conflicts and to complement each other. Land parcels should not be so large as to make circulation extremely difficult; the street pattern should not cut land areas into parcels too small to permit sound development.

17. Special vehicle traffic generators (such as parking facilities, hotels, medical arts buildings, etc.) should be located where they may be served by the street system.

18. To the extent possible, through the use of air rights and easements, multiple use should be made of street areas.

19. The distinct character of Boston and its present typical street rights-of-way should be recognized and reflected in the circulation system wherever possible.

D. PARKING

1. Parking facilities should serve clearly identifiable classes of users such as follows:

   a. Long term or all-day employee parking (for those employees who use cars for commuter purposes only).

      1) Although this type of parking is fairly large in magnitude, it should be recognized that it is in direct competition with public transportation. Therefore, it should receive the least attention of all types of parking that are to be provided.

      2) Parking for this type of user should be located at the periphery of the area on other than prime lands.

      3) All-day commuter type parking should be concentrated in large facilities with the size of facilities controlled essentially by the availability of land and the degree of vehicular access which can be provided.

      4) Such parking facilities should be located in direct contact with major vehicular entry points.

      5) Facilities should be distributed principally in accord with the direction of vehicular approach to the area.

      6) This employee parking should be essentially self-supporting but, because of its location on other than prime lands, relatively low in cost to the user.

b. Employee parking for executives and others requiring mid-day use of cars.

1) Such facilities should be extremely convenient for their users, even to the extent of being located within buildings which generate or require their use.

2) This type of parking should be limited in quantity.

3) Parking fees (or leasing charges) should be sufficient to meet the relatively high cost of such convenient parking.

c. Patron Parking

1) These facilities should be conveniently located in relation to the downtown area they serve.

2) Units should be moderate in size and related to vehicular access capacity.

3) Parking charges should be modest with consideration given to possible subsidization.

4) Patron facilities should be regulated to control length of parking, especially through the use of the parking rate structure.

d. Errand parking or high turnover facilities (especially to replace curb parking spaces).

1) Facilities should be widely distributed throughout the area.

2) Parking units should be small in size.

3) The rate structure should rigidly control the duration of stay.

2. In general, on-street parking should not be permitted. Curb space should be reserved for stopped rather than parked vehicles.

3. To the extent possible, all parking facilities should be designed to provide self-parking.

4. Entrances and exits to parking facilities are most desirably located on one-way streets, or astride two-way streets so as to minimize left-turn conflicts into and out of facilities.

5. Parking facilities, as a type of land use, should not conflict with the general continuity of other land use patterns or with pedestrian flow patterns.

6. Pedestrian linkages should be considered in locating parking facilities.

7. Where possible, the parking plan should facilitate dual usage of facilities (as for instance, daytime employee and nighttime recreational parking).

E. PEDESTRIAN CIRCULATION

1. Walking should be made feasible and desirable by placing related land uses adjacent to one another.

2. A suitable environment for pedestrians should be established. This should include in addition to other amenities, protection from weather.

3. Just as there should be continuity in the plan of pedestrian circulation, there should similarly be a continuity of elevation. For example, concentrations of pedestrians alighting from subway trains should be reconciled with possible second level pedestrian bridges and linkages.

4. Pedestrian-vehicle conflicts should be minimized; to the extent that they occur, they should be designed properly. For example, these conflicts are most serious at intersections where turning movements as well as through traffic complicate pedestrian crossings. Proper design of both streets and land use can help this problem.

5. Although the general dimensions of the downtown area make the need for mechanical pedestrian conveyances questionable, if such devices are used, then they should serve a truly distributive function. In other words, such devices are self defeating if they involve stations rather than virtually continuous access to adjacent land use.

F. SERVICE AND EMERGENCY VEHICLE CIRCULATION

1. Emergency vehicles must be able to reach any portion of the area in a reasonably direct manner.

2. Servicing of the area must recognize the needs of:

   a. Regular merchandise vehicles

   b. Quick stop service (such as mail and newspaper trucks), and

   c. Special purpose vehicles such as construction and maintenance trucks.

3. Two kinds of service facilities are required. The first, and most appropriate type for the core area, would be communal facilities such as special service courts, tunnels, conveyor systems, etc. Other buildings within the general area may require individual on or off-street loading areas.

G. GENERAL CONDITIONS

1. All elements of the circulation plan should be practical and attainable.

2. In general the circulation plan should be capable of being completed within five years.

3. The circulation plan must be stageable with individual elements to be useable as they are completed.

4. While in terms of traffic capacities, the design year is to be 20 years hence, the plan should generally be useful over the next 40 to 50 years.

Cc'rid Inc.

ARTON-ASCHMAN ASSOCIATES, INC.

neering and Planning Consultants *Chicago and Evanston*

MEMORANDUM TO: William McGrath
Boston Redevelopment Authority

FROM: Robert G. Davidson
Barton-Aschman Assoc. Inc.

DATE: September 12, 1963

SUBJECT: Inventory of Plans and Projects of Public Transportation Agencies, as They Affect Downtown Boston

The Boston Central Business District lies at the very center of a regional network of transportation facilities. The flow of goods and people to and from the business district depend upon and are continually affected by the interruption, improvement of, and the lack of improvement of, this regional network.

The plans, programs and projects of State, Metropolitan, and local transportation agencies will cause the accessibility of the Central Business District to improve or otherwise be modified. The long range effect may stimulate or allow greater increases in motor vehicle traffic; or may encourage improved mass transportation use. The location of these improvements will have a significant bearing upon the flow of persons from one part of the region, but not the others. Or, these proposed improvements may significantly change the pattern of approach into and out of the Downtown area.

Planning and designing for the Central Business District of Boston must acknowledge and account for the many expected changes in the regional transportation system. Many projects of the Massachusetts Department of Public Works, the Metropolitan Transit Authority, the Metropolitan District Commission, the Boston Public Works Department, the Boston Traffic and Parking Commission, as well as the private railroad and bus companies, have been accepted as public policy. These accepted projects <u>must</u> be assumed as components of the future transport network. Others, although not yet fully accepted or financed, have been recommended as necessary and desirable by various agencies. These, too, must be assumed as valid projects unless they have been turned aside by appropriate governmental agencies. There is a third category of plans and projects that have been suggested in the recent past, but have not received general acceptance. These improvements cannot be assumed as elements of the future regional network, but must be acknowledged and given consideration.

The "accepted", "recommended", and "uncertain" improvements are described below:

I. EXPRESSWAYS.

The expressway program for the Boston Metropolitan Region has been fully planned and programmed by the Massachusetts Department of Public Works. All of its components, as described in numerous reports, have been accepted and assumed in this study of the Central Business District as elements of the future transportation network system. They are:

Accepted:

A) The Inner Belt in its entirety from Charlestown to Roxbury.

B) I-95 (the Northeast Expressway) fully completed from the Central Artery to the New Hampshire State Line.

C) I-93 (the Northern Expressway) completed from the Inner Belt in Charlestown to the New Hampshire State Line.

D) Route 3 from the Inner Belt to the New Hampshire State Line.

E) Massachusetts Turnpike completed as designed from the South Station area to the New York State Line.

F) I-95 (Southwest Expressway) from the Inner Belt to the Rhode Island State Line.

G) Southeast Expressway and Route 3 completed from the Central Artery to Cape Code.

H) Route 128 as reconstructed.

I) I-95 (Outer Circumferential).

Uncertain:

A) The Intermediate Belt, which is recommended as a circumferential, roughly midway between the Inner Belt and Route 128. This proposal has not received any official recognition.

B) Expressway from Sullivan Square across Cambridge, the Charles River, the Back Bay and the South End, to the Central Artery at Boston City Hospital.

Analysis of Effect of Expressways Upon Downtown Boston.

The construction of multi-lane, limited access expressways which are part of the Interstate System, as well as components of the State Highway Network, will have a major impact upon travel to and from the Downtown area. This impact will be 3-fold.

The circumferential Inner Belt, acting as both a collector-distributor and connector for the radial expressways, will divert heavy volumes of motor vehicles that now travel through Downtown Boston on the Central Artery. The Inner Belt will provide an alternate route and give many motorists a better route for moving from one side of the Metropolitan Area to the other (it will not eliminate all through traffic from the Central Artery). The relocation of this through traffic movement from the Central Artery to the Inner Belt will provide additional space for vehicles with origins and destinations within the Downtown area. A high proportion of these additional vehicles will be bound for the CBD project area provided that adequate parking facilities are made available.

Although Metropolitan Boston has progressed reasonably well in the construction of radial expressways, four facilities are yet to be completed and joined with the Inner Expressway System (the Central Artery and the Inner Belt). Their completion will provide many additional lanes of high-speed movement oriented towards Downtown Boston. A good proportion of these lanes can be expected to carry vehicles to Downtown, restricted only by the limitation of Downtown Expressways, highways, and parking facilities. Barring traffic congestion condtions, all sectors of the Metropolitan Area and the fringe areas beyond will find Downtown Boston within a few minutes drive.

A third significant aspect of completion of the regional expressway network is the very substantial relief of traffic congestion on surface streets and highways. As far as Downtown is concerned, the effect will be much improved vehicular accessibility to the Downtown area on streets and highways, because of the transfer of many motorists to the Expressway network. The Inner Belt Circumferential, in particular, will relieve existing crosstown streets of a large proportion of existing traffic volumes, thus reducing the intersection conflicts of motor vehicles flows traveling circumferentially and radially. It is to be expected that the volume of radial flow on streets and highways can be increased. Again much of this flow is already oriented towards the Downtown.

I. MAJOR HIGHWAYS.

The major highways of the Boston Metropolitan Region are planned, financed, constructed, and maintained by local, regional and State public agencies. The majority of these highways have direct or indirect effect upon the accessibility of Downtown Boston to the remainder of the Metropolitan Area. Each new highway or major street improves the capacity of a link of the entire motor vehicle network that increases the capacity of flow into Downtown Boston or eliminates areas of congestion, that free bottlenecks and allow existing streets to more freely handle travel oriented into the center of the metropolis.

Because of multi-agency authority and responsibility, and a smaller proportion of Federal aid for these types of improvements, many projects have a standing or priority less than fully "accepted". More projects remain in the "recommended" and "uncertain" category, not because of their lack of necessity, but more because financing opportunities have not been fully clarified.

Those projects that will tend to improve the flow of vehicles to and from the CBD project from all reaches of the Metropolitan Area, are as follows:

Accepted:

*1965 A) Rutherford Avenue - Warren Avenue Bridge - Under Artery Highway to Haymarket Square.

*1966 B) City Square - Leveritt Circle Bridge and improvements to Chelsea-Water Street (Charlestown) and Mystic River Ramps.

*1966 C) Prison Point Bridge - reconstruction.

*1965 D) Memorial Drive Underpasses from Mount Auburn to Boston University Bridge.

*1968 E) Route 2 Reconstruction - from Route 128 to Alewife Brook Parkway.

*1967 F) Jamaicaway - Riverway Improvements - from Jamaica Pond to Huntington Avenue.

*Estimated time of completion.

G) The Government Center Circulation Plan.

Recommended:

*1969 A) Massachusetts Turnpike Extension Service Road - from Albany Street to Dartmouth Street.

*1970 B) Jamaicaway-Riverway Improvements - from Huntington Avenue to Inner Belt.

*1967-69 C) Changes in South End-South Cove Street System (see South Cove-South End Plans). Also, refer to Southwest Expressway Extension.

*1970 D) Albany Street Relocation- from Dover Street to Massachusetts Avenue in the South End.

*1972 E) Dorchester Avenue Extension - from South Bay Area to Atlantic Avenue, north of Northern Avenue.

F) Continued high capacity Atlantic Avenue from Northern Avenue to North Station.

*1970 G) Reconstruction of C-1 from East Boston Expressway to I-95 and Revere Marshes.

Uncertain: A) Charles River Dam - Northern Artery Viaduct - from Lechmere Square over Leveritt Circle.

B) Southwest Expressway Extension from Inner Belt to Copley Square.

C) New Tunnel under Boston Harbor.

Analysis of Effect of Major Highways Upon Downtown Boston.

Increasing recognition is being given to the importance of major highways as components of the circulation network. Many of the

*Estimated time of completion.

above projects that are now programmed for construction within the next 6 or 7 years, will not only circle the regional expressway system and add additional capacity to the existing street system surrounding the Downtown Area, but also will help relieve significant bottlenecks that now exist to make it possible for other roads to provide better accessibility to the CBD project area. It is to be noted that most of these projects are in areas adjacent to the Central Business District. Only one, the Government Circulation Center Plans contain projects that are contiguous to the CBD project. But most of the others that are mentioned do create radial and circumferential capacity increases in the motor vehicle system close enough to the project area to cause a distinct capacity increase potential into and around the CBD. Each must be technically evaluated individually to ascertain the full impact.

I. MASS TRANSPORTATION.

Without qualification, the major mass transportation facilities in Metropolitan Boston are oriented towards and easily serve the Downtown area. In fact, the majority of mass transportation users have destinations within Downtown Boston and the greatest proportion of these have destinations within the CBD project area. Thus all mass transportation improvements or changes have a direct bearing upon travel of persons to and from the CBD.

During the past 1 1/2 decades, the mass transportation system has been improved by only two major extensions of rapid transit facilities: the East Boston Extension to Revere and the Highland Branch Extension to Riverside. However, recent events allow more positive attitudes about the possibility of additional transit improvements throughout the region. A most recent example of this is the approval by the General Court of Massachusetts to finance an additional extension to the north and for studies of three other extensions throughout the Metropolitan Area.

The improvements that have been most fully discussed are:

Accepted:

*1965 A) Relocation and extension of the MTA Main Line from Haymarket Square to the Malden-Melrose municipal boundaries.

Recommended:

*1966 A) Extension of the MTA East Boston Line from Wonderland to Revere Marshes.

*1967 B) The extension of the MTA Forest Hills Line to West Roxbury and Dedham (or Needham) or to Hyde Park and Dedham.

*1967 C) Replacement of the MTA Forest Hills Line from Washington Street in Roxbury and the South End to the New Haven Railroad Main Line right-of-way in the South Cove Area to Forest Hills.

*1966 D) Re-creation of rail transit service to the South Shore (terminal points unknown, probably Braintree) from the South Station Area with possible connections to the Cambridge-Dorchester Rapid Transit Line and Forest Hills Line in the South Cove Area.

*1965 E) Elimination of Lechmere Branch and Development of Boylston Street Tunnel Shuttle Service from North Station to Kenmore Square and Northeastern.

*1972 F) The conversion of the PCC operation to a rapid transit train shuttle service from North Station to Kenmore Square and Northeastern through the Boylston and Tremont Street subways.

*1970 G) Conversion of the Highland Branch PCC operation to a higher capacity rapid transit service connecting to the Washington Street Tunnel.

*1964 H) The substantial reduction or even possible elimination of private railroad commuter service.

I) Construction of off-street parking facilities along Rapid Transit.

*Estimated time of completion.

Uncertain:

A) Extension of MTA Malden-Melrose Line to Route 128 in Reading.

B) Extension of MTA Malden-Melrose Line from Charlestown to Somerville, North Cambridge and possibly Arlington.

C) Extension of MTA Harvard Line from Harvard Square to North Cambridge and possibly Arlington.

D) Construction of Stuart Street PCC Subway from Boylston Street Station to Prudential.

E) Extensions of the Commonwealth Avenue and Huntington Avenue subways.

Analysis of Effect of Mass Transportation Improvements Upon Downtown Boston.

The extension of rapid transit service into areas of Metropolitan Boston now served by infrequent railroad commuter trains is expected to attract greater amounts of persons into Downtown Boston. Equally, or even more important, mass transit improvements will help to provide a more balanced transportation system and will thereby help to relieve some of the pressures for vehicular access to the CBD area.

IV. DOWNTOWN OFF-STREET PARKING FACILITIES.

As part of its capital improvement program the City of Boston has stated intentions of constructing a number of off-street parking facilities in and around the Downtown Area. At present, there has been no stated policy as to the function (use characteristics) or rate structures of these facilities. They are currently listed as follows.

Accepted:

*1965 A) Government Center Parking Terminal - 2000 spaces

timated time of completion.

*1966	B)	South Station Parking Terminal	- 3000 spaces
*1965	C)	Prudential Parking Terminal	- 1000 spaces

Recommended:

*1965	A)	Central Business District	- 500 spaces
*1965	B)	Back Bay	- 500 spaces
*1966	C)	Waterfront Project	- 700 spaces
*1966	D)	Huntington Avenue	- 500 spaces
*1967	E)	South End-City Hospital	- 1500 spaces
*1969	F)	Waterfront Project	- 500 spaces
*1968	G)	South Cove	- 1000 spaces
*1968	H)	Massachusetts Avenue	- 500 spaces
*1968	I)	Mission Hill	- 500 spaces
*1969	J)	Kenmore Square	- 500 spaces

Analysis of Effect Upon Off-Street Parking in Downtown Boston.

Quite clearly, creation of the number of spaces described above will encourage additional persons into Downtown Boston by motor vehicles. The distribution of the facilities will tend to distribute the increase in motor vehicles throughout the Downtown Area. Only the Central Business District Garage, expected to have a 500-car capacity, will encourage greater travel to this CBD Project Area.

It is impossible to prescribe the exact impact until the specific locations and use requirements are further specified. It must be recognized that the locations and priorities of the above-mentioned garages can be changed.

Estimated time completion.

ARTON-ASCHMAN ASSOCIATES, INC.

neering and Planning Consultants Chicago and Evanston

MEMO TO: William McGrath, Transportation Coordinator
Boston Redevelopment Authority

FROM: Robert G. Davidson
Barton-Aschman Associates, Inc.

DATE: September 20, 1963

SUBJECT: Establishment of Preliminary Circulation Planning Criteria for Downtown Boston

The purpose of this memorandum is to establish the gross planning criteria and travel magnitudes for the Central Business District Circulation and Parking Study. The quantities set forth below will act as initial overall design guides for the study. They will be further modified and refined as additional travel and land development information becomes available.

Downtown Boston is the single largest generator of travel in New England and is expected to continue in this dominant position. It lies in the hub of an ever increasing network of highway and rail transportation facilities. Over two million trips by people in cars, trucks, and mass transportation occur each day within this relatively small and intensely developed area. The future will see this magnitude continually increase as the Downtown Area remains the central site for commercial development.

The magnitude and characteristics of the many types of existing and future trips to Downtown Boston are specified below. These values have been assembled, collated, analyzed, and presented as the set of travel planning criteria within which the circulation plans for the Boston Central Business District are to conform. This conformance thereby assures that the CBD street, highway, parking, and mass transit development program is consistent with the travel habits and apparent desires of the three million people of Metropolitan Boston and the additional millions elsewhere in New England.

The process for assembly of this planning criteria data has included review and analysis of all existing studies of the subject (see list of reference material in appendix) and numerous special studies undertaken in cooperation with the Boston Redevelopment Authority, the Boston Parking and Traffic Commission and the Boston Police Department. Additional information was gained from parts of many studies undertaken in large cities throughout the country.

A. PERSON TRIPS TO DOWNTOWN BOSTON *

Existing - 1963

The existing number of people who travel into Downtown Boston during an average day is estimated to be 570,000. This estimate is a product of reconcilation of data found in the Boston Redevelopment Authority Master Plan Draft (1963), Boston College Transportation Studies (1959), Metropolitan Transit Authority Data, Boston Parking and Traffic Commission Motor Vehicle Counts and Data supplied by the Boston Redevelopment Authority GNRP Project Area Transportation Plans.

The value of 570,000 person trips represents the one-way flow into Downtown Boston each day. The value does not include walking trips, the amount of trips that pass through the Downtown Area, or those trips generally staying within the area.

It is to be noted that the total number of person trips destined or originating in the downtown area each day is less than previously estimated quantities set forth in other studies. This circumstance can be traced to the extensive amount of transition of many sections of Downtown. Completion of the many buildings now proposed will re-establish the higher volumes of travel within two or three years.

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* Downtown Boston is that area of the Boston peninsula lying northeast of Massachusetts Avenue and bounded by the Charles River, Boston Harbor and the Fort Point Channel.

Future - 1980

The amount of future travel to Downtown can be expected (as a minimum) to increase in the same general proportions as the amount of additional development to occur within the area. For each new building that places additional square feet of office, retail, wholesale and other types of uses within the Downtown Area, there will be additional travel by motor vehicle, truck and mass transportation. The additional amounts of each type of travel will be dependent upon the amount of new development, its location and the use to which it will be devoted. The Boston Redevelopment Authority Master Plan Draft of 1963 and other recent studies have visualized a growth factor in the Downtown Area of between 12-20%, by 1980. This growth pattern generally reflects the Metropolitan population and economic expansion expected by 1980. To be sure, the Downtown Area may receive more or less than the general estimates, depending upon local taxing policies, transportation improvements, and other influences. However, in very general terms, 12-20% expansion in the Downtown Area appears a valid range for over-all guidance for transportation planning.

Such an expansion will cause an additional 70,000 to 100,000 persons to be attracted into the Downtown area each day. The total average flow would then become 670,000 person trips per day. Unquestionably, other additional trips can be induced into the downtown when and if transportation facilities are created to provide better than normal accessibility; i.e. if off-street parking spaces are constructed in choice locations, or if rapid transit facilities are made far more convenient it can be expected that total travel will exceed the values quoted above. On the other hand, if transportation facilities are inadequate in capacity and convenience the amount of travel will be less than the quantity stated above.

B. MODAL SPLIT OF PERSON TRAVEL TO DOWNTOWN BOSTON

Existing - 1963

The type of transportation used by persons traveling to or from the Downtown Area is as shown below:

1. Person Trips by Motor Vehicles		380,000
a) Automobile trips (motor vehicles at 1.54 occupants per vehicle)	230,000	
b) Truck trips	30,000	
2. Person trips by Mass Transportation		190,000
a) By MTA Rail	160,000	
b) By railroad	20,000	
c) By bus (including MTA)	10,000	
Total Person Trips		570,000

These estimates have been assembled and collated by review of Cordon Count Data, reconciliation with other reports on transportation and MTA information. A review of the most recent data available shows that in 1962 the Downtown rapid transit stations experienced an additional decrease of downtown fare collections. As a result, estimated MTA rail person trips from the Downtown Area during an average day, has decreased from 180,000 in 1959 to 160,000 for the most recent year, 1962. Concurrently, motor vehicle travel to the Downtown Area appears to be steadily increasing, partly because of the opening of the Callahan Tunnel.

Future - 1980

The future mode of travel to downtown Boston and the Central Business District Project Area will be conditioned primarily by the capacity and convenience of the future network of facilities serving the area. During the past 15 years the major improvements to the transportation system have been in the form of creating new automobile facilities (i.e. Mystic River Bridge and the Northeast Expressway, Storrow Drive, the Southeast Expressway, the Central Artery and the Callahan Tunnel and East Boston Expressway). These facilities plus many local improvements have caused a very significant increase in automobile capacity and convenience into the downtown and accordingly a distinct and steady increase in automobile use.

Simultaneously the improvements to the transit system have been far fewer and the competitive position of transit has sharply diminished.

The immediate future is expected to be a continuation of the "emphasis on automobiles" trend. Projects now contemplated for completion within five years will contribute to a total automobile system containing a capacity of twice the size of that which existed just after World War II.

Unfortunately, the transit system has suffered heavily from the automobile competition and the inability to make comparable improvements. The rapid transit extension to Malden is the single improvement that can be counted upon in the next two years.

Those highway improvements that can be expected to directly increase the automobile capacities into and out of Downtown Boston are:

New Facilities	Estimated Additional Capacity one Direction - Per day
Warren Avenue Bridge	10,000 Vehicles
City Square-Leverett Circle Connection	10,000 "
Massachusetts Turnpike (3 lanes)	60,000 "
Albany Street Relocation *	0
Dorchester Avenue Extension *	5,000 "
	85,000 Vehicles

*NOTE: Albany Street and Dorchester Avenue improvements may create a greater additional capacity than shown. However, other changes in the South End may further reduce the entering capacity at Massachusetts Avenue.

The additional motor vehicle capacities created by the above facilities are expected to be fully utilized. The resultant vehicle flows (in one-direction) into downtown Boston in the 1980 period will be increased as shown below:

	Vehicles/day
a. Existing (1963) motor vehicle flow (into Downtown Boston)	260,000
b. Existing through trips (discussed later)	140,000
c. Expected new volumes	85,000
Total 1980 Motor Vehicle Volume (Entering Downtown)	485,000

A good share of the entering vehicle capacity into the Downtown Area is utilized by traffic flowing from one side of Downtown to the other, i.e., through traffic. This condition is expected to continue because of the basic design of the expressway network. It is estimated that 185,000 vehicles will attempt to move through the Downtown Area in the future (both directions). The resultant capacity remaining for vehicles destined for the Downtown Area is 300,000 motor vehicles per day. This quantity, with an occupancy rate of 1.45 persons per auto will allow 430,000 persons to enter into Downtown each day in automobiles and trucks. Of these, 45,000 person trips are expected to be in trucks (an estimated 35,000 trucks) and 385,000 are expected to be in automobiles.

Rapid transit capacities entering, leaving and within the Downtown are not expected to change significantly nor be fully utilized. The extension to Malden will increase the capacity of the MTA mainline slightly because of improved design; the expected abandonment of commuter railroad service in downtown Boston can be described as a decrease in capacity. But these occurrences will have little effect upon the existing capacity, that far exceeds the current and expected use. Better use of the available transit capacity than now exists is dependent upon improvements that will extend good service into the constantly growing suburbs that lie beyond the MTA District.

Because of the Malden extension, commuter railroad elimination and other changes, rapid transit use is expected to increase. The 1980 projected mode of travel to downton Boston is as follows:

SUMMARY OF FUTURE TRAVEL PROJECTIONS *

1. Person Trips by Motor Vehicle		430,000
a) Automobile trips	265,000	
b) Truck trips	35,000	
2. Person Trips by Mass Transportation		230,000
a) By MTA rail	210,000	
b) By bus (including MTA)	20,000	
Total Person Trips		660,000

*NOTE: These are preliminary numbers subject to change.

Compared to existing flows, use of the downtown mass transportation system will increase from 190,000 person trips to 230,000 or 21%. The rapid transit system which must replace the service of the railroad is expected to increase from 160,000 to 210,000 or 31%. If these expectations prove valid, the rapid transit system would serve almost as many downtown trips as it did in 1950. In addition, these transit use projections call for a slight increasein the required role of transit in that it must accommodate 35% of all person trips to the downtown whereas it now accounts for 33.5%.

C. ESTIMATED TRAFFIC PASSING THROUGH DOWNTOWN BOSTON BY MODE

The basic pattern of the expressway and transit systems of Metropolitan Boston coupled with the geographic configurations of the land and water borders of the region and the location of Downtown Boston, create conditions which induce relatively large portions of travel to pass through the Downtown Area. Persons traveling from Dorchester, Quincy, Malden, etc. to the Northeast Sector of the Metropolitan

Area, i.e. East Boston, Revere, Chelsea, Lynn and the North Shore, find that the easiest route is the Central Artery, passing through the Downtown Area. Much the same is true of the transit system which is radial in nature, so that transit riders are encouraged to pass through Downtown in order to reach destinations on the other side of the Downtown Area.

The Inner Belt Circumferential can be expected to help reduce the proportion of vehicular through traffic once it is constructed. The relief that the Inner Belt will create will be primarily during the peak hours. Much of the off-peak travel will remain on the Central Artery because of its advantageous location.

Computations aimed at determining the exact amount of through traffic are less accurate than many of the other values computed in this report. Transportation studies indicate that the amount of through traffic in 1959 approximated 140,000 vehicles per day. This constituted 35% of the traffic entering the Downtown Area daily.

This value is generally consistent when reconciled with the amount of traffic entering and accumulating in the Downtown Area. These values are also known to be consistent with the amount of through traffic calculated by the Transportation Division of the BRA.

Through trips on rapid transit lines have been calculated as the difference between the average out-of Downtown transit stations and the number of persons leaving the Downtown Area on transit lines (after subtracting an estimated 10% of downtown station use as the quantity of intra-area downtown transit trips). Thus the calculations are as follows:

Existing - 1963

Number of persons leaving Downtown Area on transit lines		(240,000)
Number of persons paying fares at downtown stations - 1962	180,000	
Estimated number of intra-downtown trips	20,000	
Calculated volume of transit riders going out of Downtown per day		160,000
Resultant number of transit riders passing through Downtown		(80,000)

Future - 1980

Future volume of transit riders traveling through the Downtown Area is pertinent to the Central Business District Project in that adequate capacity must be retained for these trips. However, actual 1980 volumes of through transit riders is impossible to estimate accurately because they will be so greatly influenced by the type and amount of development occurring throughout the Metropolitan Area, and the improvements made to the highway system. For purposes of calculation only, the future patterns and magnitudes have been assumed as follows:

Number of persons leaving Downtown Area on transit lines		(290,000)
Number of persons paying fares at downtown stations - 1980	235,000	
Estimated number of intra-downtown trips	25,000	
Calculated volume of transit riders going out of downtown per day		210,000
Resultant number of transit riders passing through downtown		(80,000)

D. SECTOR OF ORIGINATION OF TOTAL DOWNTOWN DESTINED PERSON TRIPS

The origin of trips from throughout Metropolitan Area Boston to the Downtown Area and points beyond can only be determined by origin and destination surveys. At the present time, the Mass Transportation Commission of the Commonwealth is undertaking a comprehensive origin and destination survey. The results of this study will not be available for many months. Therefore, the data presented below has been taken from origin and destination counts undertaken previously by various organizations.

Existing - 1959

Sectors	No. of Trips	% of Total Flow
Northeast	82,000	14.2 %
Northern	94,000	16.4
Northwest	73,000	12.75
Western	78,000	13.75
Southwest	73,000	12.8
Southern	170,000	29.7
	570,000	

Studies further estimated the number of person trips by transit and motor vehicles from each sector as follows:

Sectors	Estimated Transit Trips	Estimated Person Trip in Motor Vehicles
Northeast	28,000	54,000
Northern	32,000	62,000
Northwest	28,000	45,000
Western	27,000	51,000
Southwest	27,000	46,000
Southern	48,000	122,000
	190,000	380,000

NOTE: These values reflect 1959 conditions before rail transit service to the South Shore was eliminated.

Future - 1980

The origins of trips to Downtown from throughout the Metropolitan Area in the future is strongly dependent on the patterns of residential and commercial development throughout the Eastern Massachusetts Area. This, in turn is strongly influenced by the improvements that will occur in the regional transportation network.

The origins of trips to Downtown Areas is as shown below:

Sectors	% of Region	No. of Person Trips
Northeast	13.2	87,000
North	16.4	108,000
Northwest	14.8	95,000
West	15.8	104,000
Southwest	10.7	71,000
Southern	29.5	195,000
		660,000

Estimates of mass transportation use for 1980 and the resultant number of person trips by motor vehicle are as follows:

Sectors	No. of Transit Trips	% of Region	No. of Trips and Motor Vehicles	% of Region
Northeast	32,000	13.8	55,000	12.6
North	38,000	16.6	70,000	16.2
Northwest	36,000	15.8	59,000	14.3
West	34,510	15.0	70,000	16.2
Southwest	25,500	11.0	45,000	10.5
Southern	64,000	28.0	131,000	30.2
	230,000		430,000	

The above estimates of transit flows are dependent upon construction of the transit improvements listed as "accepted" and "recommended" in an earlier memo, dealing with Metropolitan Planning Projects. The failure to achieve any one of those projects will reduce the flows from that sector of the Metropolitan Area so concerned.

E. DAILY PERSON TRIPS TO THE CENTRAL BUSINESS DISTRICT PROJECT AREA

The data described below is a preliminary estimate of the amount of travel by mode to the various parts of the Central Business District, based upon previous studies of origins and destinations throughout the Metropolitan Area. The primary source of data showing the relative distribution of trips within the Downtown Area are the Maguire and Coverdale and Colpitts Studies of 1945 and 1957. These distributions have been utilized by the Parking Study of the City Planning Board in 1954 and have been subsequently utilized here to allocate the person trips to the various functional areas in the Central Business District.

The area of the CBD referred to in this section is larger than the Project Area now under study. In addition to the CBD Project Area, this area contains the State House Area, all of the office districts, all of the leather-wholesaling district, and part of the South Cove Area.

The estimated number of person trips to this area by mode of transportation is as follows:

Existing - 1963

	Person Trips/Day
Total person trips for average day (excluding trucks)	265,000
Total person trips in motor vehicles (excluding trucks)	135,000
Person trips using mass transportation	130,000

The above number differs from the values shown in the Downtown Parking Study because of substantial changes in mass transportation use experienced during the past 7 years.

MTA data showing numbers of persons using MTA stations in this Central Business Area indicate that some 120,000 fares were paid at nearby transit stations. Assuming that 10,000 of these were for inter-area trips and that 20,000 out of a total of 30,000 rail and bus users had destinations in the CBD area, total transit users originating in this area are 130,000 rather than the 165,000 indicated in the Parking Report.

The future amount of travel in the Central Business Area is in the first instance dependent entirely on the amount of growth of floor space and jobs within the Business District. For purposes of preliminary calculations, it has been assumed that total travel will increase from 12 to 20% and that mode of travel will increase accordingly as follows:

Future - 1980

	Person Trips/Day
Total person trips for average day (excluding trucks)	300,000-320,000
Total person trips in motor vehicles (excluding trucks)	145,000-155,000
Person trips using mass transportation	155,000-165,000

F. DISTRIBUTION OF PERSON TRIP DESTINATIONS WITHIN THE CENTRAL BUSINESS DISTRICT PROJECT AREA *

The distribution of person trips within the Central Business Area is described below. The estimates are based upon data incorporated within the off-street parking study of the Boston City Planning Board (1954), the reports dealing with origins and destinations referred to above, and estimates of the travel generating power of land uses within the CBD. For each of the sub-zones of the Central Business Area the total amount of person trips is as follows:

Existing - 1963		Total Person Trips
Sub-Areas -	1. State House Area	20,000
	2. Office District	80,000
	3. Retail Area	105,000
	4. Leather, Entertainment, Park Square Area	60,000
	Total	265,000

*NOTE: This includes trips originating from outside of the Downtown Area only, and excludes truck and walk trips.

Future - 1980		Total Person Trips
Sub-Areas -	1. State House Area	22,000-23,000
	2. Office District	93,000-98,000
	3. Retail Area	122,000-131,000
	4. Leather, Entertainment, Park Square Area	63,000-68,000
	Total	300,000-320,000

The above values are considered as preliminary estimates. They will be further refined and modified to relate to the CBD project boundaries as soon as data on current land use within the project is made available.

The travel generating factors that have been utilized to calculate the amount of sub-area person trips per day are listed below. In all cases the data refers to the number of person trips originating from beyond the limits of Downtown Boston and therefore excludes intra-Downtown trips and walking trips.

	Trip Generation (in square feet of use per person trip)
a) Retail, Consumer Services and Institutional	70-100
b) Manufacturing and Utilities	110-140
c) Office	175-200
d) Wholesale and Storage	250-350

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ARTON-ASCHMAN ASSOCIATES, INC.

ineering and Planning Consultants: 600 Davis Street, Evanston, Illinois 60201 UNiversity 9-0660

MEMORANDUM TO: William R. McGrath
Boston Redevelopment Authority

FROM: Michael A. Powills, Jr.
Barton-Aschman Associates, Inc.

DATE: June 23, 1964

SUBJECT: Analysis of Existing Circulation and Parking in Downtown Boston

I. INTRODUCTION

The purpose of this memorandum is to set down the findings and conclusions resulting from an analysis of existing conditions in the Downtown Central Area (DCA) of Boston. The memorandum with its accompanying tables, charts, and illustrations is also a means for recording and preserving data which may be useful for other purposes.

A number of special studies were made in order to assemble information required for the planning of downtown circulation and parking. These studies[1] included the following:

- Inventory of trucks throughout the area.
- Roadside interviews of vehicles on selected streets.
- Inventory of parking facilities including occupancy and turnover rates.
- Accumulation of parked vehicles both on and off-street.
- Interview of pedestrians to determine origins and destinations, purpose of trip, and mode of transportation.

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(1) A complete description of these studies is included in the Stage One Work Program for the Boston C.B.D., prepared by Barton-Aschman Associates, Inc. and submitted to B.R.A. on August 27, 1963.

- Pedestrian volume counts.

In addition to specially assembled information, significant use was made of data collected by others. Such data included traffic flow information from the city, M.D.C., D.P.W. and M.T.A., as well as data assembled by other consultants for the various public agencies.

II. VEHICULAR TRAFFIC

Information on vehicular traffic was obtained both from available sources and from special field studies. Data were examined in the following area.

A. Traffic volume counts for the morning and afternoon peak hours were analyzed to determine the relative usage of the various facilities. Figure 1 (A.M. peak hour) and Figure 2 (P.M. peak hour) illustrate this usage and lead to the following observations:

- There is a remarkable similarity between A.M. and P.M. peak hour flows.

- Significant turning movements are found at the intersections of Park, Boylston, and Stuart Streets with Tremont Street. Approximately one-third of the traffic approaching on Tremont Street turns west at each of these intersections.

- Turning movements of an even greater magnitude are found around the Public Gardens, where traffic must execute one-half of a figure "S" in order to travel to or from Back Bay. Only at the Central Artery connections can similar turning volumes be found.

- Vehicles crossing the Fort Point Channel bridges have a directional distribution opposed to that normally expected during peak hours, i.e., inbound to D.C.A. during the P.M. peak.

- Northbound traffic generally avoids Dewey Square, although Dewey Square serves as a significant focal point for traffic and is the location of heavy turning movements.

- There are very heavy movements between South Boston and to and from the north on the Central Artery.

B. Roadside interviews were conducted at four locations in the CBD from 7 A.M. to 9 A.M., 10 A.M. to 11 A.M., 2 P.M. to 3 P.M., and 4 P.M. to 6 P.M. The origin-destination data is summarized in Figure 3.

Approximately 45 percent of the persons interviewed indicated trip origins and/or destinations such that they should not have passed the interview station. Twenty-five to 30 percent of the trips were of a through nature that could or should have bypassed the study area. A startling 20 percent of the trips were illogical--northbound drivers were interviewed on southbound streets, etc. (In most similar studies, given more efficient street systems, this figure usually ranges from two percent to five percent.) Less than 10 percent of the trips were wholly internal to the CBD.

Vehicle classification and trip purpose are summarized in Table 1, and disclosed that of the mid-day interviews at the Washington Street location, fewer drivers indicated shopping as the purpose of trip than at other stations. It is also significant that a high proportion of vehicles on Tremont and Washington Streets are trucks. This amounts to approximately 20 percent during the A.M. peak hour and about 15 percent mid-day.

The average private passenger car occupancy at all stations was found to be 1.51 persons per vehicle.

More detailed information as to zones of origin and destination may be found in Figure 4 and Table 2.

III. TRANSIT

Figure 5 represents the average daily one-way trips to D.C.A. via mass transit. Rapid transit volumes were determined both from line counts and the fares paid at the various stations.

Rapid transit passengers approaching from the south and west are significantly greater in number than those from the north. Rail passengers, however, are more equally divided with approximately 12,000 arriving at North Station and 10,000 at South Station.

Bus passengers use the facilities of 14 bus companies for transportation to D.C.A. The majority of these persons arrive in the Park Square area, utilizing three terminals and the on-street bus stops of the Egleston M.T.A. line. Only the North Station-South Station shuttle provides service through the study area; all other lines terminate on the periphery.

IV. SERVICE VEHICLES

A. Service vehicles predominately use the streets for their loading and unloading operations. The truck accumulation study summarized in Table 3 revealed that less than five percent of the service and commercial vehicles used off-street facilities. A series of once-an-hour instantaneous observations found from 500 to 600 commercial vehicles stopped on-street in the CBD during the major portion of the day. Figure 6 illustrates the maximum number of trucks observed at each block in the study area. While exact figures are not available, these data would indicate a normal accumulation of about 700 to 900 commercial vehicles either moving or stopped in the D.C.A.

B. Curb parking studies revealed that the average duration of stay for commercial vehicles is approximately 20 minutes. ~~The majority~~ A significant number of these trucks are parked (or double-parked) illegally.

V. PEDESTRIANS

A. Pedestrian flows in the CBD were measured during the Noon and P.M. peak hours and the diagrams of Figure 7 prepared. There is a significant similarity between the two hours, with flows concentrated near the intersection of Summer, Winter, and Washington Streets. The heavy concentrations near the 100 percent corner and various subway stations also serve to point out those locations where greatest demands are made on available sidewalk widths.

B. Pedestrian interviews at locations throughout the CBD permitted construction of illustrations portraying zone-to-zone movements (Figures 8 and 9) and the linkages with the 100 percent corner (Figures 10 through 13). (Any comparison of zone-to-zone movements must consider the significant differences in zone size.)

Pedestrians were also interviewed to determine their purpose in being in the CBD as well as the reason for the immediate walking trip. This data may be found in Table 4. Additional interviews were conducted at the 100 percent corner to ascertain the mode of transportation used by persons at the 100 percent corner. The close proximity of rapid transit facilities serves to explain the fact that 70 percent of the persons interviewed at this location indicated transit as their mode. (See Table 5.) The distance travelled from home (by mode of transportation) to the 100 percent corner was also determined and is shown in Figure 14.

C. Auto users were questioned as to where they parked and this information combined with the pedestrian interviews on origin and destination indicates that regardless of purpose of trip or mode of transportation, the ~~average~~ median walking distance of pedestrians in the CBD is approximately 1000 feet. (See Figure 15.)

VI. PARKING

A. An inventory of existing off-street parking facilities in the D.C.A. revealed a total supply of 11,900 off-street parking spaces as shown in Figure 16. Existing peak usage of D.C.A. off-street parking facilities was determined from parking ticket surveys and actual counts of vehicles parked. It was found that nearly 12,000 cars were parked in off-street facilities during the period of peak accumulation. Observers noted that, due to vehicles parked in aisles, ramps, and entrances, the rated capacity of some facilities was exceeded by as much as 15 to 20 percent during this period.

A study of parking duration (parking ticket analysis and field observation) determined that of the 11,900 off-street parkers, 3200 were short term parkers (less than five hours) and 8700 ~~3700~~ were long term parkers. This is illustrated in Figure 17. Note that the total number of parked vehicles in an area can be greater than the rated capacity of the area and the figures still show vacant space available. This results from the fact that while some facilities may have vacant spaces, others are overfilled.

A study of turnover in typical off-street parking facilities in the D.C.A. revealed the following turnover rates for the 12-hour period from 7 A.M. to 7 P.M.

Long term parking	1.1
Short term parking	2.8

Arrivals and departures at off-street parking facilities in D.C.A. were also determined from the parking ticket analysis and from field observations. These are shown in Table 8 and disclose that during the period from 4:30 to 5:00 P.M., autos are discharged from off-street facilities to the circulation system at a rate equivalent to 5000 vehicles per hour.

An inventory of parking fees at off-street facilities yielded the following information:

Time Period	Low	Most Frequent	High
First ½ hour	$0.25	$0.50	$0.50
First hour	$0.45	$0.75	$1.00
Additional hours	$0.25	$0.50	$1.00
All day	$1.00	$2.00	$3.50
Evenings	$0.50	$1.00-$1.50	$2.00

More detailed data concerning fees for the first hour and all day rates may be found in Figures 18 and 19.

B. A survey of curb parking facilities indicated that 850 of the 900 legal curb spaces were occupied during the period of peak accumulation. At the same time, there were 1950 illegal curb parkers and 300 double parkers in the D.C.A.

A detailed study of curb usage at 21 curb faces in the D.C.A. revealed the following turnover rates during a 12-hour period for curb parkers:

Legal curb	7.0
Illegal curb	12.0
Double parked	16.0

This same study indicated that the parking duration of on-street parkers followed the pattern indicated below:

	½ Hr. Or Less	½ - 5 Hrs.	More Than 5 hr.
Legal curb	37%	60%	3%
Illegal curb	77%	22%	1%
Double park	88%	12%	-

C. A survey of off-street parking in the fringe areas adjacent to D.C.A. resulted in an estimate that of 5900 off-street spaces available, approximately 3600 are used by D.C.A.-oriented vehicles. The peak occupancy by these D.C.A.-oriented vehicles is estimated to be 3000 off-street spaces. It is further estimated that 80 percent of this parking is long term parking.

D. The hourly accumulation of parked vehicles in D.C.A. is shown in Figure 20. Existing parking supply and peak usage may be summarized as follows:

D.C.A.	Existing Supply	Peak Demand
Off street	11,000	11,900
Legal curb	000	850
Illegal curb*	--	2,250
Total	12,800	15,000
Fringe	3,600	3,000
GRAND TOTAL	16,400	18,000

*Includes double parkers.

MAP/ls

EXISTING TRAFFIC FLOW

A.M. PEAK HOUR

EXISTING CIRCULATION AND PARKING
DOWNTOWN BOSTON

BARTON-ASCHMAN ASSOCIATES, INC.
EVANSTON, ILLINOIS

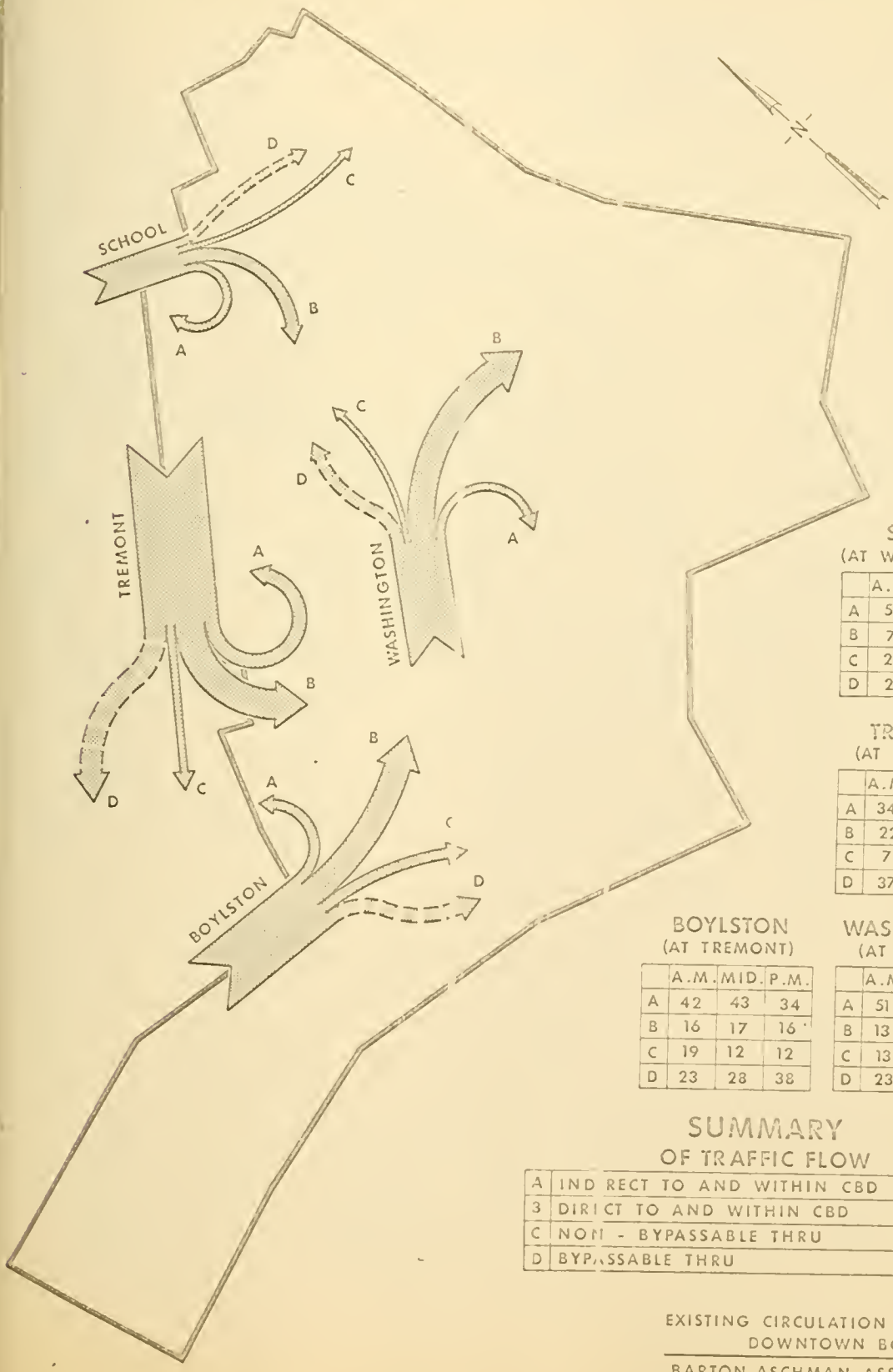
EXISTING TRAFFIC FLOW

P.M. PEAK HOUR

EXISTING CIRCULATION AND PARKING
DOWNTOWN BOSTON

BARTON-ASCHMAN ASSOCIATES, INC.
EVANSTON, ILLINOIS

TRAFFIC MOVEMENTS AT FOUR LOCATIONS



SCHOOL
(AT WASHINGTON)

	A.M.	MID.	P.M.
A	51	39	32
B	7	23	24
C	21	13	16
D	21	25	28

TREMONT
(AT BOYLSTON)

	A.M.	MID.	P.M.
A	34	37	45
B	22	26	13
C	7	8	13
D	37	29	29

BOYLSTON
(AT TREMONT)

	A.M.	MID.	P.M.
A	42	43	34
B	16	17	16
C	19	12	12
D	23	28	38

WASHINGTON
(AT BEDFORD)

	A.M.	MID.	P.M.
A	51	47	46
B	13	32	21
C	13	5	4
D	23	16	29

SUMMARY
OF TRAFFIC FLOW

A	INDIRECT TO AND WITHIN CBD	15 - 20%
B	DIRECT TO AND WITHIN CBD	40 - 50%
C	NON - BYPASSABLE THRU	10 - 15%
D	BYPASSABLE THRU	20 - 30%

EXISTING CIRCULATION AND PARKING
DOWNTOWN BOSTON

BARTON-ASCHMAN ASSOCIATES, INC.
EVANSTON, ILLINOIS

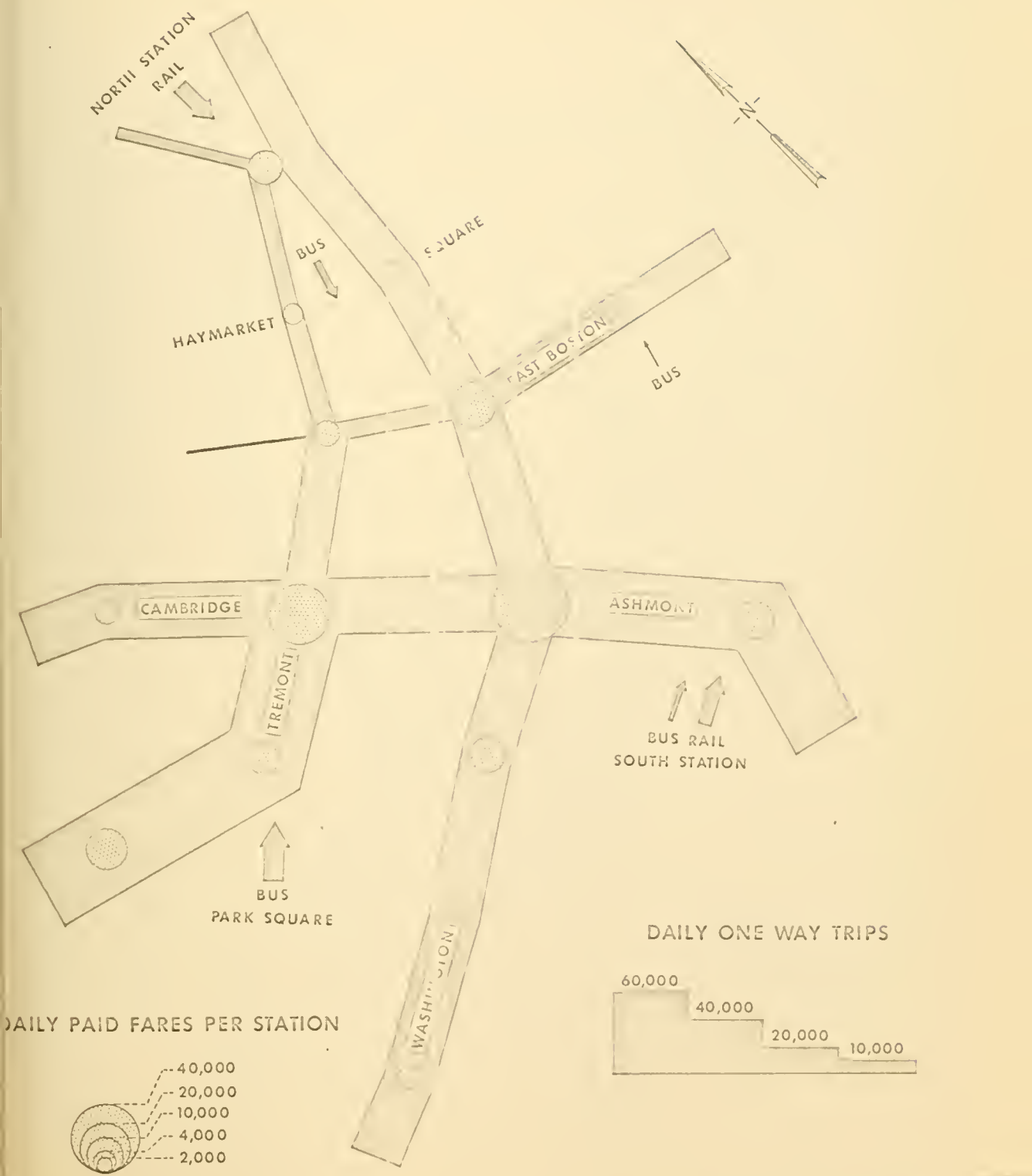
ONE MAP

OR TRAFFIC INTERVIEW STATIONS

EXISTING CIRCULATION AND PARKING
DOWNTOWN BOSTON

BARTON-ASCHMAN ASSOCIATES, INC.
EVANSTON, ILLINOIS

EXISTING TRANSIT FLOW



EXISTING CIRCULATION AND PARKING
DOWNTOWN BOSTON

BARTON-ASCHMAN ASSOCIATES, INC.
EVANSTON, ILLINOIS

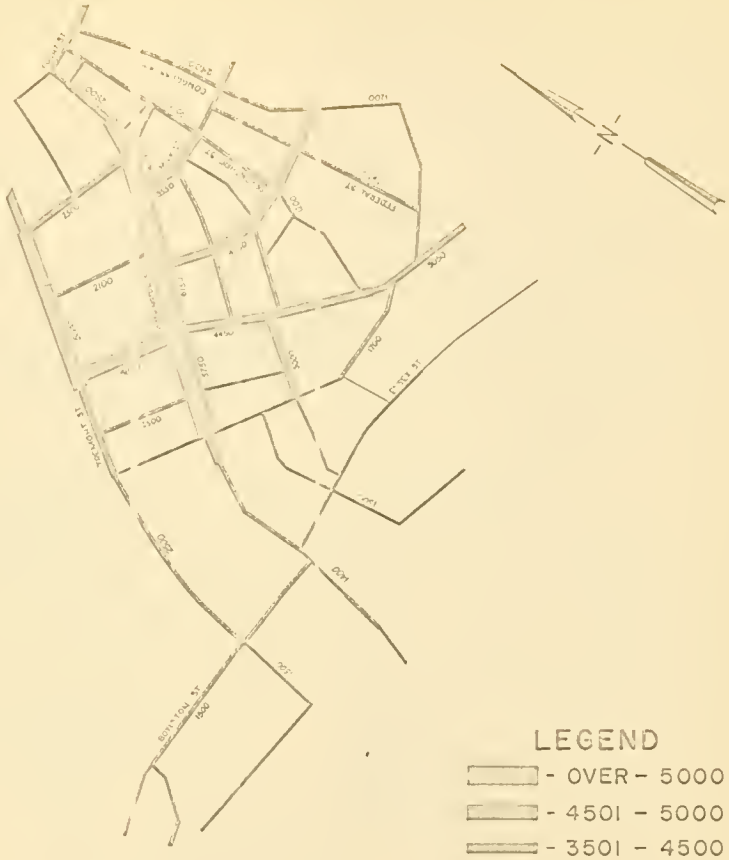
TRUCK ACCUMULATIONS

EXISTING CIRCULATION AND PARKING
DOWNTOWN BOSTON

BARTON-ASCHMAN ASSOCIATES, INC.
EVANSTON, ILLINOIS

PEDESTRIAN FLOW

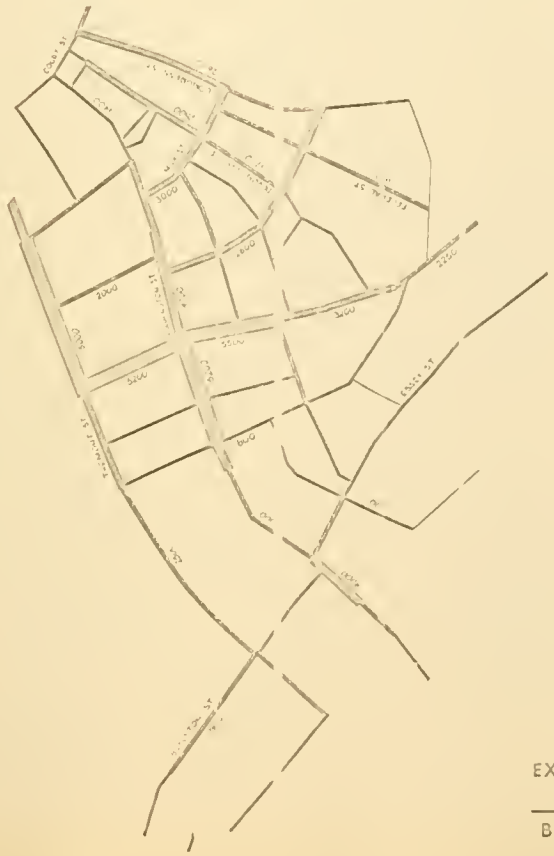
12:00 - 1:00 P.M.



LEGEND

- OVER - 5000
- 4501 - 5000
- 3501 - 4500
- 2501 - 3500
- 1501 - 2500
- 501 - 1500
- UNDER 500

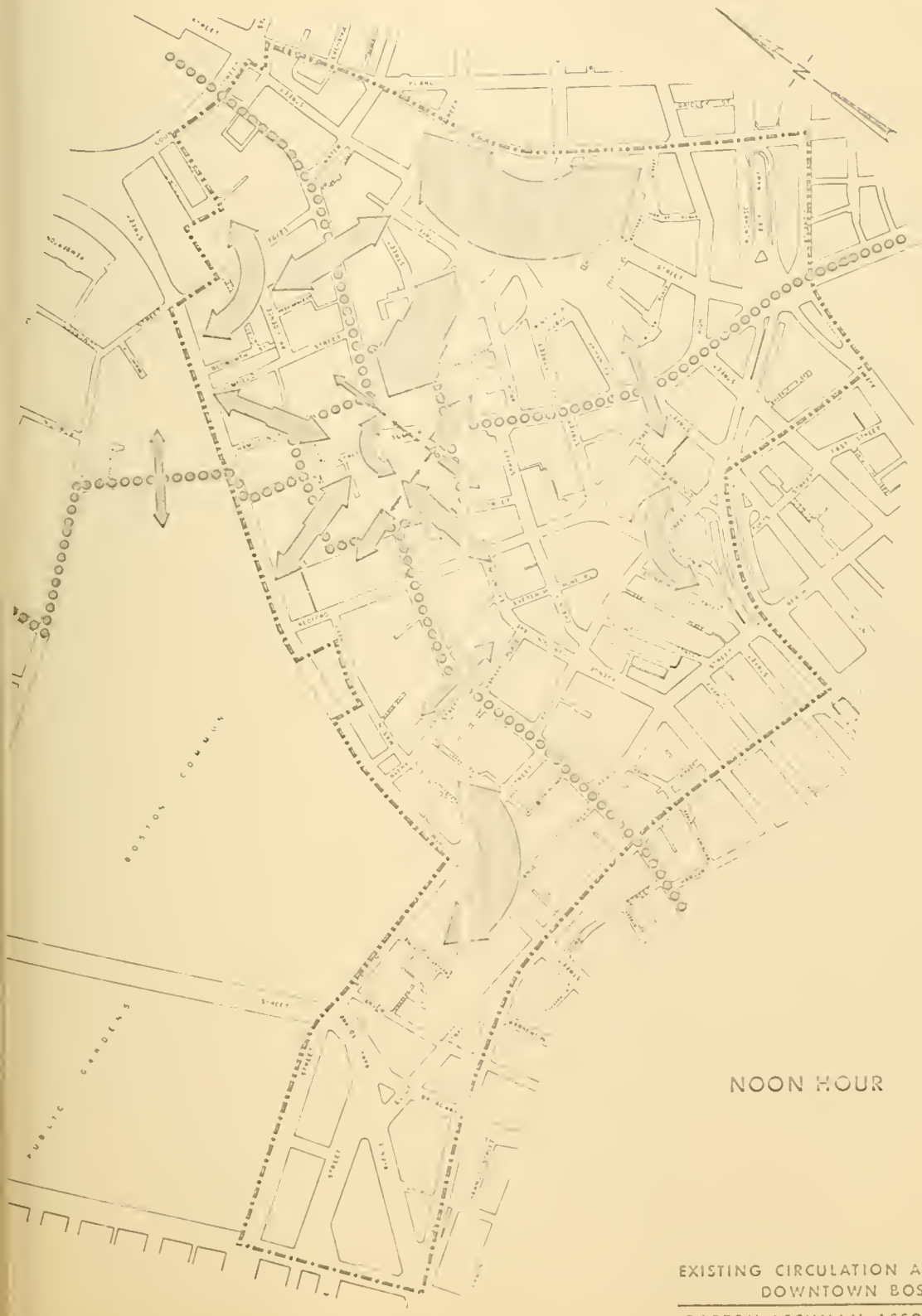
4:30 - 5:30 P.M.



EXISTING CIRCULATION AND PARKING
DOWNTOWN BOSTON

BARTON-ASCHMAN ASSOCIATES, INC.
EVANSTON, ILLINOIS

ZONE TO ZONE PEDESTRIAN MOVEMENTS



NOON HOUR

EXISTING CIRCULATION AND PARKING
DOWNTOWN BOSTON

BARTON-ASCHMAN ASSOCIATES, INC.
EVANSTON, ILLINOIS

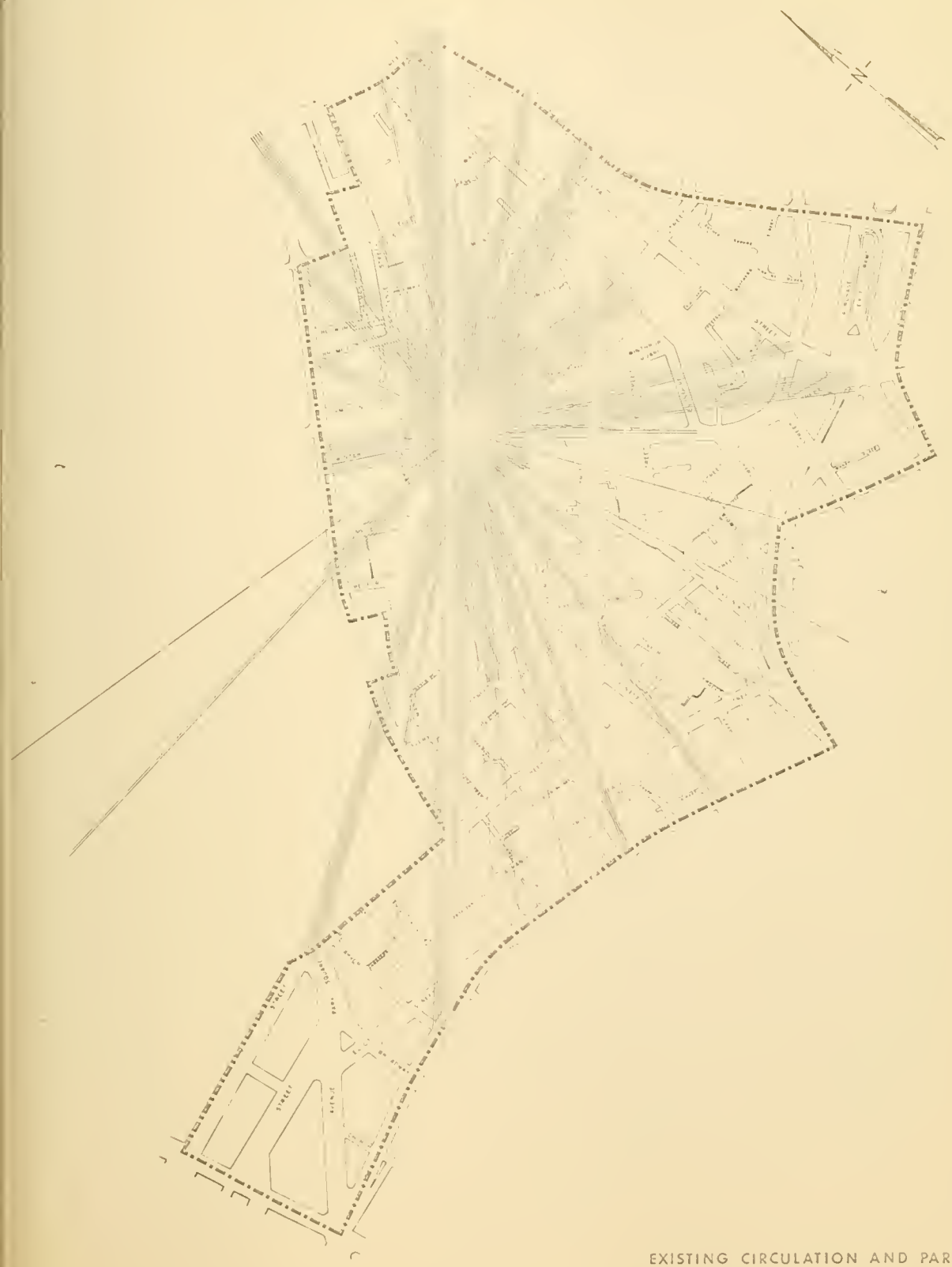
ZONE TO ZONE PEDESTRIAN MOVEMENTS

EXISTING CIRCULATION AND PARKING
DOWNTOWN BOSTON

BARTON-ASCHMAN ASSOCIATES, INC.
EVANSTON, ILLINOIS

RETAIL CORE PEDESTRIAN FLOW

NOON HOUR SHOPPING TRIPS



EXISTING CIRCULATION AND PARKING
DOWNTOWN BOSTON

BARTON-ASCHMAN ASSOCIATES, INC.
EVANSTON, ILLINOIS

RETAIL CORE PEDESTRIAN FLOW

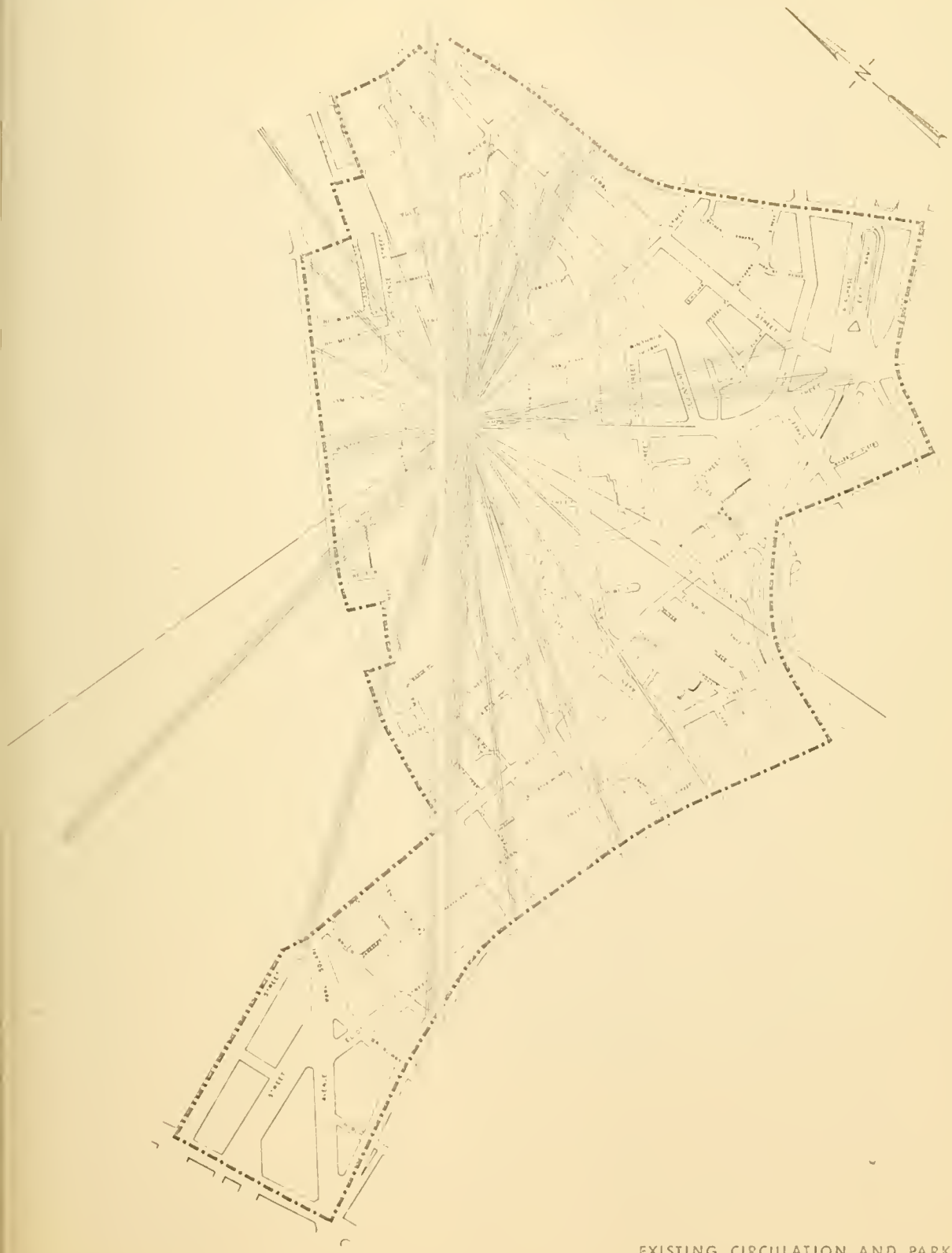
NOON HOUR NON-SHOPPING TRIPS

EXISTING CIRCULATION AND PARKING
DOWNTOWN BOSTON

BARTON-ASCHMAN ASSOCIATES, INC.
EVANSTON, ILLINOIS

RETAIL CORE PEDESTRIAN FLOW

EVENING PEAK HOUR SHOPPING TRIPS



EXISTING CIRCULATION AND PARKING
DOWNTOWN BOSTON

BARTON-ASCHMAN ASSOCIATES, INC.
EVANSTON, ILLINOIS

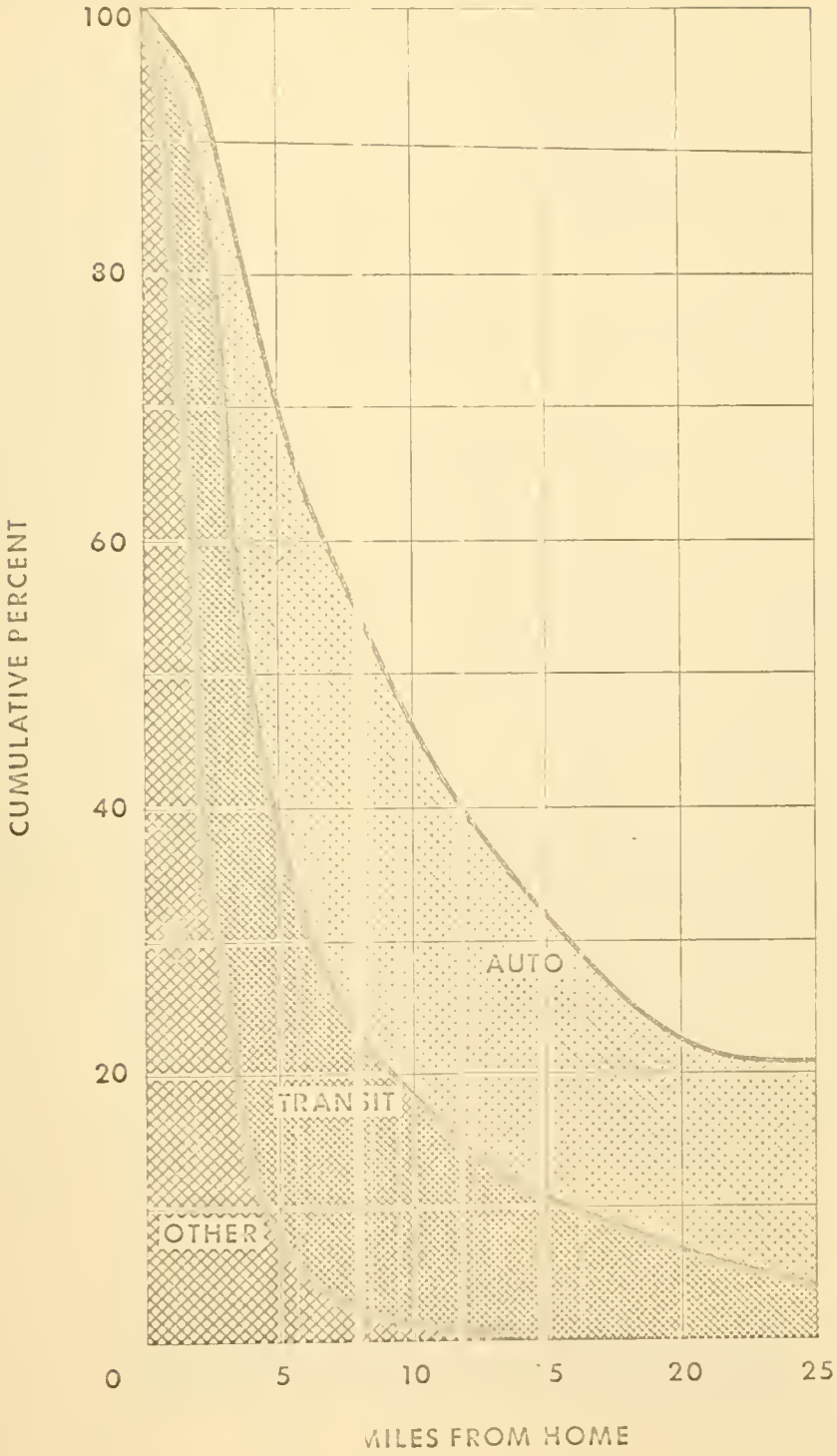
RETAIL CORE PEDESTRIAN FLOW

EVENING PEAK HOUR NON-SHOPPING TRIPS

EXISTING CIRCULATION AND PARKING
DOWNTOWN BOSTON

BARTON-ASCHMAN ASSOCIATES, INC.
EVANSTON, ILLINOIS

ORIGIN OF DOWNTOWN PEDESTRIANS



MODE OF TRANSPORTATION AND DISTANCE
FROM HOME TO CBD

EXISTING CIRCULATION AND PARKING
DOWNTOWN BOSTON

BARTON-ASCHMAN ASSOCIATES, INC.
EVANSTON, ILLINOIS

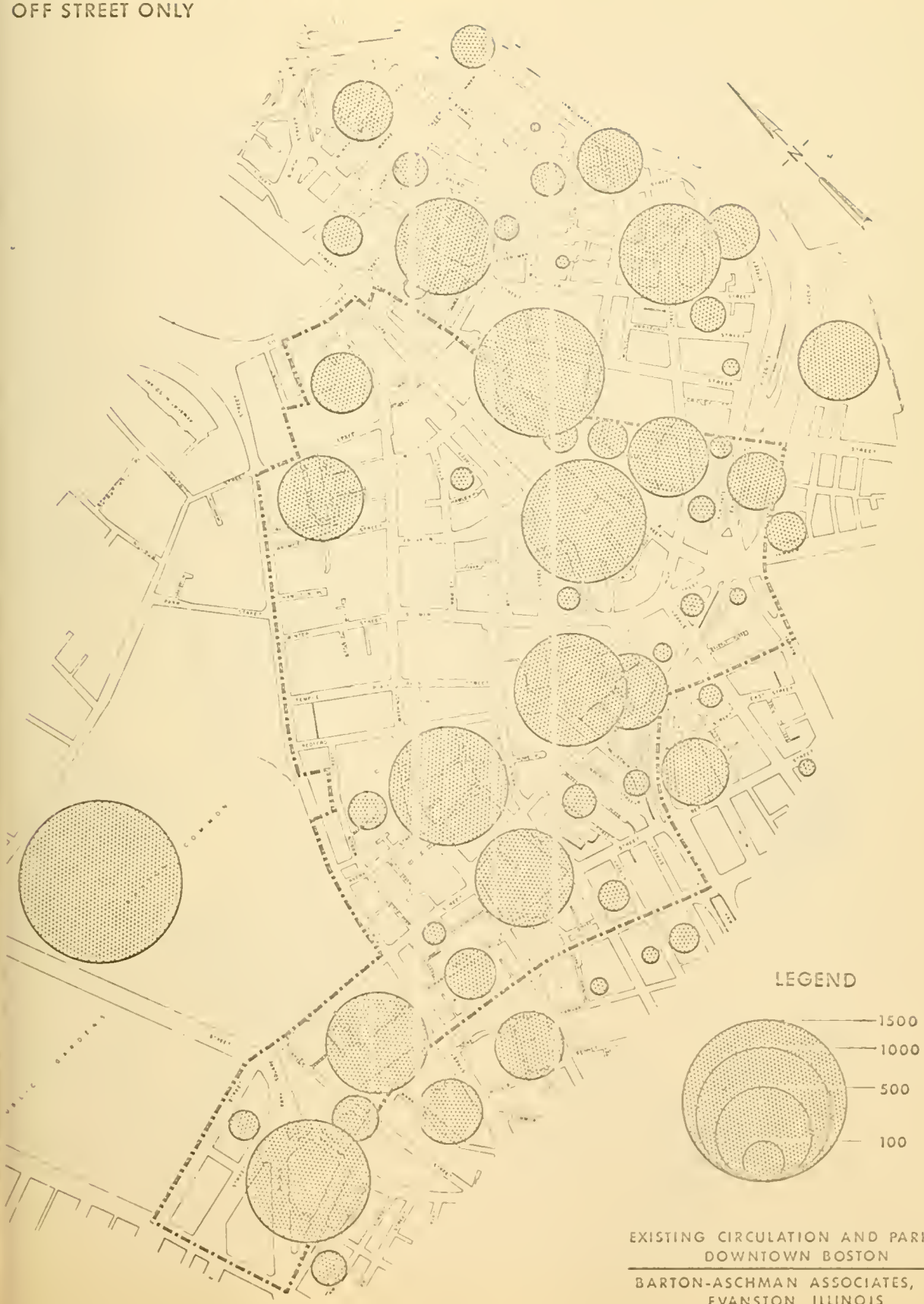
PEDESTRIAN WALKING DISTANCES

EXISTING CIRCULATION AND PARKING
DOWNTOWN BOSTON

BARTON-ASCHMAN ASSOCIATES, INC.
EVANSTON, ILLINOIS

PARKING CAPACITIES

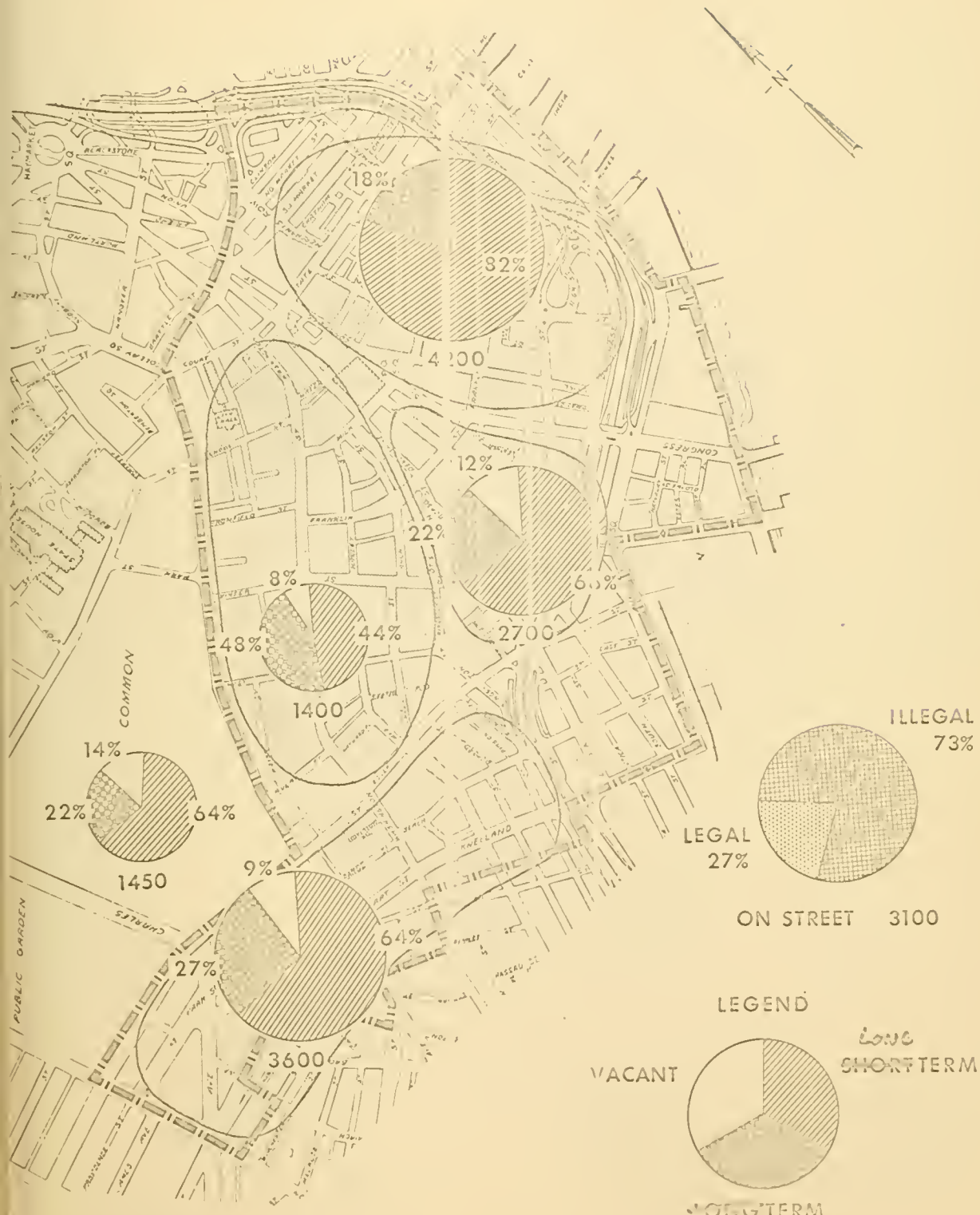
OFF STREET ONLY



EXISTING CIRCULATION AND PARKING
DOWNTOWN BOSTON

BARTON-ASCHMAN ASSOCIATES, INC.
EVANSTON, ILLINOIS

PARKING SUPPLY vs OCCUPANCY



EXISTING CIRCULATION AND PARKING
DOWNTOWN BOSTON

BARTON-ASCHMAN ASSOCIATES, INC.
EVANSTON, ILLINOIS

DOWNTOWN PARKING RATES

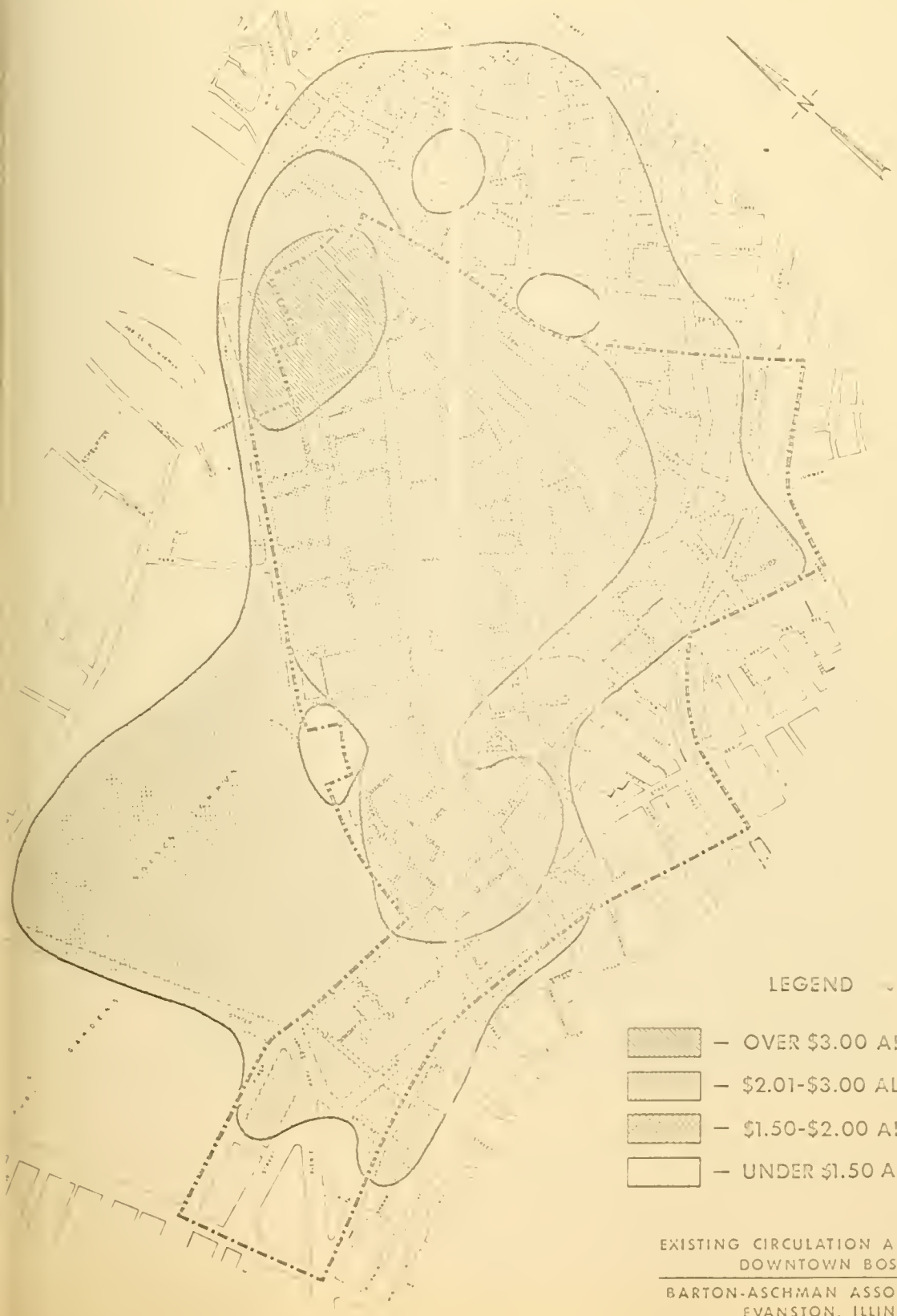
FIRST HOUR

EXISTING CIRCULATION AND PARKING
DOWNTOWN BOSTON

BARTON-ASCHMAN ASSOCIATES, INC.
EVANSTON, ILLINOIS

DOWNTOWN PARKING RATES

ALL DAY



EXISTING CIRCULATION AND PARKING
DOWNTOWN BOSTON

BARTON-ASCHMAN ASSOCIATES, INC.
EVANSTON, ILLINOIS

ACCUMULATION OF PARKED VEHICLES

EXISTING CIRCULATION AND PARKING
DOWNTOWN BOSTON

BARTON-ASCHMAN ASSOCIATES, INC.
EVANSTON, ILLINOIS

PROFESSIONAL STAFF

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THE STAFF OF BARTON-ASCHMAN ASSOCIATES *includes some thirty-eight full-time professional engineers and planners, over half of whom have had more than 10 years of responsible experience. This experience has included major consulting assignments, service as public officials in charge of major work in engineering, comprehensive planning and urban renewal, and teaching and research assignments. The professional staff is supported by full-time technicians, draftsmen, and clerical personnel.*

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